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Electrical World

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The Industry's Scions Proving Worthy of Their Sires

A FEATURE of the convention of the Association of Edison Illuminating Companies at New London which transcended in importance the papers and addresses was the interest taken in the proceedings by the younger men of the industry. It was essentially a young man's convention, and to hear these men express themselves frankly and openly on matters affecting the generation, transmission and distribution of electricity, to see them rubbing elbows with seasoned veterans, was most encouraging. Nothing means so much to an industry or augurs more for its future than to have a lot of enterprising, alert and well-schooled men willing and ready to step into the shoes of the leaders and take up the burdens of management when the pioneers lay them down. Many an excellent business has been unable long to survive the death of the head of the house merely because little or no attention had been paid to organization. Apparently such a fate is not in store for any of the Edison companies. Little by little authority and responsibility are being placed on the shoulders of the rising generation. Young engineers now plan and build, and to younger hands is intrusted much of the business of load building. As a result of years of painstaking work in fitting them for new responsibilities the industry, through these young men, is constantly renewing its strength. The turnover is not great. Men stick to the business because it is attractive and offers good opportunities, and thus the progression is ever onward and upward. This is a tribute to the leaders of today and is eloquent of promise for the industry of tomorrow.

Utility and Steel-Mill Co-operation

A PROMINENT executive in the steel industry recently said that thirty years ago one worker produced only a half ton of steel products in the time that he today produces five tons. This tremendous increase in productive power the executive attributed largely to the introduction of electricity in his industry. Ample evidence of the truth of the statement was afforded at the convention of the Association of Iron and Steel Electrical Engineers in Pittsburgh last week, where a notable exhibit of equipment combined with a series of able papers to convince observers and hearers of the predominating influence of electricity in the steel industry.

This industry has been electrified only because of the hard work of both steel-mill electrical engineers and manufacturers of electrical apparatus. The fight for electricity was long and bitter in an industry inherently conservative and wedded to traditional practices. But once installations were made production increased so greatly and costs decreased so largely that the most conservative executive became a believer in the new source of power. A real engineering job was done, for the field was studied, the equipment was carefully made, and the installations were provided with facilities for expanding as the business grew and in addition were endowed with flexibility and efficiency to handle the varying requirements of production.

Today another innovation is being pushed in the steel industry which marks a forward step in the conservation of fuel resources. This step involves the complete utilization of waste heat, the complete motorization of mills and the interchange of energy with central stations. It marks an advance in superpower because it involves a common power pool for utilities and the steel mills and insures reliable service as well as the elimination of waste. The specific possibilities are indicated in the paper by Messrs. Skinner and Mahoney abstracted in this issue, and the few interconnections already in operation show that the theoretical possibilities can be realized in commercial practice. The plan is economically sound and will be followed eventually to a very large extent.

The Age of Steam and the Age of Electricity

"BETTER fifty years of Europe than a cycle of Cathay!" exclaimed Tennyson eighty-two years ago. The fifty years upon which the British poet looked back had seen the growth of steam power from incipiency to maturity and the rapid spread of its domain. Steam-driven machinery had, amid riot and blind opposition, replaced manual labor in the mills and workshops. Primitive waterwheels were decaying in a hundred streams because their place had been usurped by the stationary engine. The stagecoaches which had reached so high a pitch of development had given way to the locomotive and the rail. On the ocean and the lakes sails had become obsolescent if not obsolete. The era of industrial expansion had had its vigorous beginning, when the means of gratifying human wants multiplied as rapidly as did the wants themselves and when trade increased by leaps and bounds.

When Tennyson wrote the familiar line, Faraday in England and Henry in America were engaged in their revolutionary electromagnetic researches. Oersted and Ampère had twenty years before laid the foundation of all future electrical progress. But the telegraph was still in embryo, and it was two years after the publication of "Locksley Hall" when Washington hailed Baltimore over Morse's experimental line. The Atlantic cable was twenty-four years in the future and the telephone ten more. It was the Age of Steam, and Watt, Stephenson and Fulton were its deities.

Great as were the material achievements of the half

century that lay between the French Revolution and 1842, much as they were added to by the generation that immediately followed, these advances dwindle when contrasted with the first half century of the Age of Electricity, upon which the ELECTRICAL WORLD last week cast a retrospective glance. Writing just before electric illumination became a fact, an English historian said of the telegraph: "This use of electricity possesses for us an interest especial and unique. It is the first human invention which is obviously final. In the race of improvement steam may give place to some yet mightier power; gas may be superseded by some better method of lighting. No agency for conveying intelligence can ever excel that which is instantaneous. Here for the first time the human mind has reached the utmost limit of its powers." The writer did not foresee the telephone with its facilities for direct conversation; nor did he foresee that the same agency he praised was to provide the power mightier than steam, the light better than gas. Steam is a giant, the limitation of whose strength and service, great as these are, is clearly seen by all men. Electricity is a wizard whose potential capabilities no man knows. Its marvels have become the commonplaces of present-day life and new discoveries in its realm no longer cause astonishment. Steam and the era of machine production that came with it were bitterly fought and denounced. Electricity has been welcomed from the first. Its functions are not merely industrial. It has chased darkness from city streets and rural highways; it has lessened dirt and thwarted crime; it has gone where steam could never go—into the homes of the people, lightening the housewife's toil; it has provided speedy transport between business streets and residential districts, and has linked isolated regions with the world. Yet its work has only begun.

Electric Furnaces Increasing in Number

THE war demand gave an artificial stimulus to electric furnace applications which resulted later in a slump. Recent reports show electric furnaces again on the up grade as a result of new developments in design and a better understanding of their merits in producing fine grades of steel. In the steel mills proper they are used for refining and melting, but it is also encouraging to note an increased demand for electric furnaces in foundry practice, because the foundry is a very large and almost virgin field for electrical applications.

The design and application developments in furnaces have resulted in greater reliability, decreased maintenance costs and increased capacity per day. The designs have been improved, the refractories have been better made and installed, and through chute charging, removable tops, double hearths, preheating and other methods the time between heats has been greatly reduced. The formed and pasted electrodes have been more successfully produced, and, although a controversy exists as to their relative merits, both are cheaper and better adapted to furnace conditions than heretofore.

Moreover, the development of control equipment and the installation of multiple furnaces have combined to convince central-station companies that furnace loads today are assets which should be obtained if at all possible. The central station should take an active part in the campaigns for the further introduction of furnaces and other heat applications to industry.

Higher Station Costs Bring Commercial Responsibility

BEFORE the world war the cost of steam-power stations was in the neighborhood of $75 per kilowatt of capacity and engineers looked forward to the day when this cost might be brought down to $55 or less. But these hopes were shattered, and today $150 per kilowatt is not an unusual cost to pay. Because of the great expansion of the industry within this period somewhere from 60 to 80 per cent of the total investment represented by power stations today has been established at these high prices.

In a recent address in Chicago John F. Gilchrist, vice-president of the Commonwealth Edison Company, cited these facts and pointed out how great a responsibility this condition imposes upon the commercial men of the industry. For with this increased cost of stations come heavier carrying charges and greater need for a higher rate of profit on the energy sold. This is most easily obtainable by the more careful selective development of business that will improve load factor and the earning capacity of the plant. It is an interesting thought worth consideration by sales managers and their selling men. It should be interpreted to them in detail that they may know the cost and value of the business they take on the lines.

The Use of the Schools in the Home-Lighting Campaign

THE plan of the Lighting Educational Committee for the distributing of the home-lighting primers and local contest material through the public, parochial and private schools is occasioning some debate among central-station men. It is reported that in New York City the primers are to be given out from the stores of the utilities, contractors and dealers, and that the schools will not be asked to distribute the campaign material in classrooms. Chicago has decided not to attempt to reach the children through the schools. It is said that in various other communities it is thought that no effort should be made to enlist the co-operation of the educational authorities, lest the industry lay itself open to a charge of seeking to use the schools in the interests of private business. In spite of this, however, we find the no less interesting fact that in a very much larger number of communities the schools have welcomed the idea and are co-operating eagerly with the local contest committees. In some cases, in fact, state educational departments have openly indorsed the campaign in the hope of stimulating local schools to co-operate. Superintendents in other towns have voluntarily written to principals in neigboring communities to urge participation. In short, evidence is piling up that in the majority of cases the local board of education and the school teachers recognize the element of public service in this educational effort to interest children and their parents in the care of the eyes through the improvement of home lighting and that they are ready to assist. Naturally, the school authorities are human and may be expected to differ from one another in their opinions.

The important point is, however, that the success of the local contest is not dependent upon school co-operation. Undoubtedly the simplest and most direct approach to the child will be through the schools, and if the school authorities approve and desire to help, the committee recommends this method of distributing the

primers. But if the school does not respond enthusiastically, or if the central-station company for any reason hesitates to use the schools for fear of misinterpretation and criticism, it will be far better not to call upon the schools for any help. Certainly no attempt should be made in any town to urge and persuade the schools to permit the distribution of the contest material in classrooms.

As a matter of fact, the children may be reached in many ways quite independent of the schools. The primers may be mailed out to all customers of the light and power companies, or may be left at each house by the meter readers, or may be advertised as available at all electric stores. This might mean some waste, but every one who reads will be a "prospect." Therefore no local committee need fear to join the home-lighting campaign because some one is reluctant to approach the schools. If the central-station company does not approve of this method of reaching the children, the primers may be put out some other way without crippling the contest at all.

The Small Consumer as Insurance Against a Rainy Day

DESPITE the fact that during the industrial setback in New England power sales by the Worcester (Mass.) Electric Light Company dropped off 25 or 30 per cent, the company recently declared its regular dividend at the rate of $12 annually and an extra one of $10 a share. The ability to take such action in a period of depression and with residential service rates among the lowest in the state speaks volumes for the efficient management of this utility. In the fundamental commercial policy which made this possible there is an object lesson for central-station executives in developing various classes of business.

Worcester is a city of widely diversified industries, and as most of its manufacturing plants already use central-station power there is a limited field for growth in this direction. The population, now above 200,000, is increasing slowly and the curve of new customers added each year is flattening out, so that the amount of new business from this source is comparatively small. However, a general practice of intensive development of present consumers is followed. Particular attention has been given to residential and to small commercial and power customers. The company maintains alert and energetic appliance merchandising and lighting departments, and its power sales department has been notably successful with industrial electric heating. As a result the utility has built up this class of business to a point where a decrease even of 30 per cent in power sales did not jeopardize its net earnings.

While there is a distinct thrill in closing a contract with a large power user whose heavy demand and long-hour use will help increase station efficiency and lower production costs, it should always be remembered that the small consumer with his diversified demand is the mainstay of the central station through fat times and lean. The industry in its infancy was built upon the sale of energy in homes, stores and offices, and as companies have grown this class of business always has been and can always be depended upon, for unlike the power load it is only moderately affected by the ups and downs of industrial prosperity.

Inferentially, the power business should not be neglected, for it holds a most valuable and important position in relation to central-station service and earning capacity. It has dictated the construction of superpower plants and transmission systems, and in turn quantity production of kilowatt-hours has made possible reductions in the price of energy to the customer. But there is security in numbers, and when a company takes pains to cultivate its small customers, as is done at Worcester, it writes the best kind of insurance against a rainy day in industrial activity.

Buy the Best Available

WITH an exact science like electricity and years of experience in design and manufacture, it is now possible to build electrical machines which conform to modern service requirements. As put by one industrial engineer, the best repair shop today is none at all, and this elimination can be achieved if the best machines only are purchased. Whether it be a prime mover or a motor in a factory, service and industrial conditions today dictate this policy. The loss of service of a large prime mover or a loss of a fraction in possible efficiency results in dollar and service losses which make negligible the price difference between the best machine and the machine of average quality.

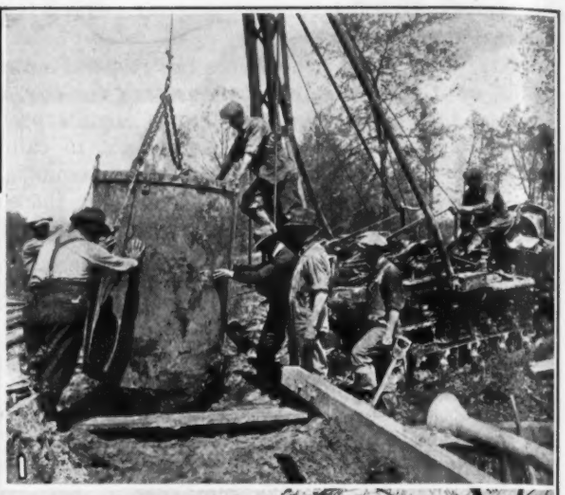
In the same way the use of old-type motors or those reconnected or poorly designed will surely penalize the factory owner in power factor, in efficiency and in reliable production to a much greater degree than can be offset by any savings realized from a decrease in motor investment.

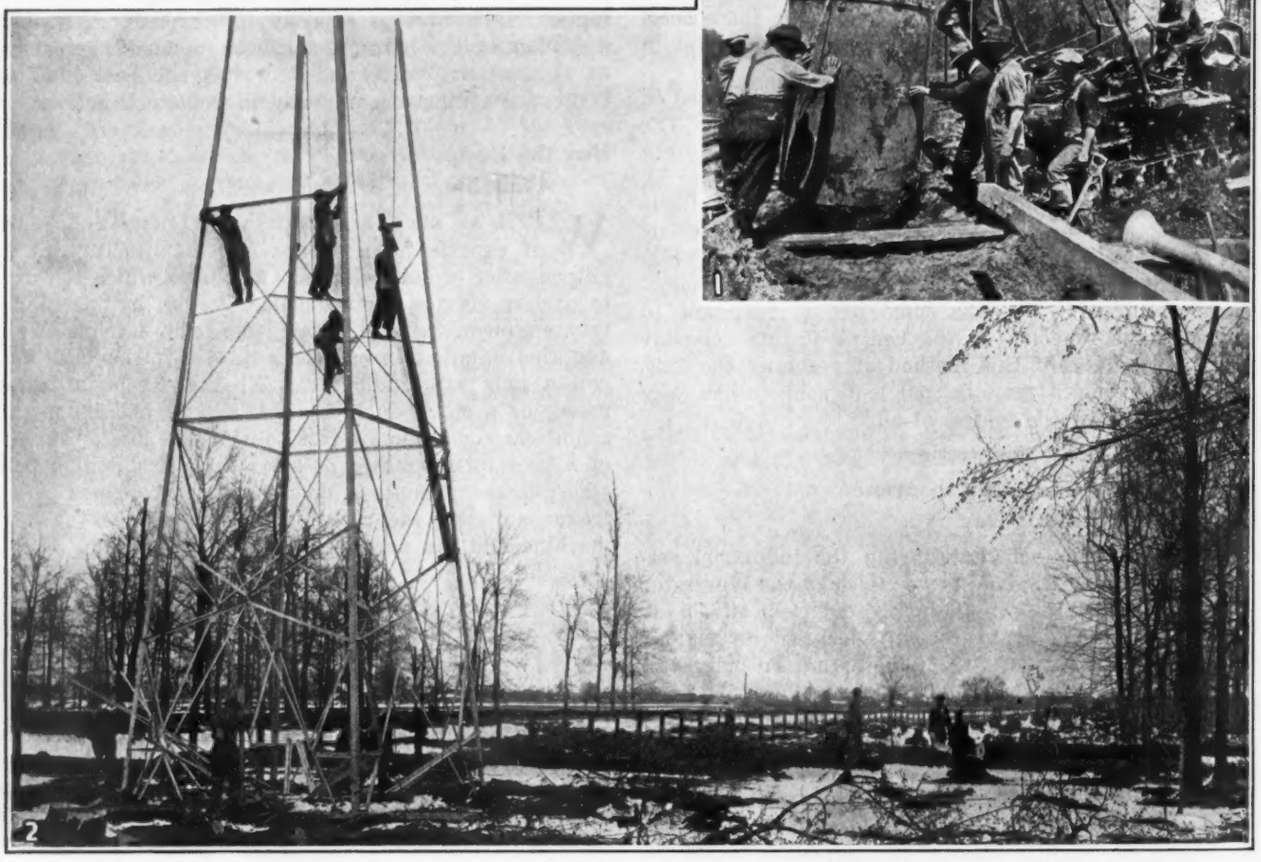
There is no place for poorly designed and unreliable electrical equipment in any branch of industry, and there is no excuse for the purchaser to buy or the manufacturer to make this type of standard machinery in the light of present knowledge and existing service requirements.

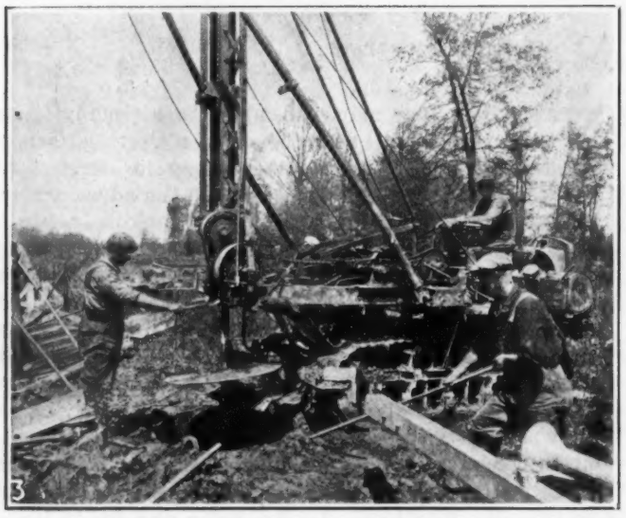
A Youthful Centenarian of Science

NAMED for the man who added to his many titles to fame that of being the pioneer electrical scientist of America, and numbering among its services to the arts and sciences many directed to the advancement of electrical theory and practice, the Franklin Institute of the State of Pennsylvania abundantly deserves the congratulations on its hundredth birthday which leaders of the electrical industry in common with men of prominence in other callings last week showered upon it. It is a happy coincidence for electrical men that this centennial year sees at the head of the Franklin Institute a man who has rendered signal service to his own industry as chief engineer of a great central-station company, as an able and industrious committee worker and as a high officer in both major national electrical organizations. To Mr. Eglin was due in large part the assembly at Philadelphia of so many eminent scientists from America and abroad. Their presence at and participation in the centenary exercises were a fitting tribute to an institution which, formed for the purpose of combining in one organization features both of the mechanics' institutes of early days and of the exclusive scientific societies, has for a hundred years served all branches of science and all degrees among the votaries of knowledge in an unselfish, democratic, wise and comprehensive way that have shed unique luster upon it.

Power Equipment Used to Build the New Detroit Line







THE organization of the gangs and the method of handling material was changed from time to time as the work on the lines has progressed. The construction force as at present organized consists of two anchor setting gangs, one for each boring machine, three tower erecting gangs and a gang to clear right-of-way, set foundations requiring hand excavation and do other similar work. The anchor setting gangs have about ten men each, of whom two are machine operators and the rest laborers. The tower erecting gangs are made up of eight men each, four bolters and four ground men. Two of these tower erecting gangs are combined to form a wire stringing gang when a sufficient stretch of towers has been completed.

The motor equipment plays an important part in the construction organization. Four 1½-ton trucks with pneumatic tires and two light delivery wagons are used to transport the gangs to the job and back and also to distribute material for the line. These light trucks are able to get to most of the tower locations without difficulty except for a month or so in the spring. The steel, wire and insulators are shipped to convenient railroad sidings along the route of the line so that the hauling distances are quite short. This material is then distributed as required for each operation, anchor steel first, then tower steel, insulators and wire. Only in the winter in preparation for the spring thaws is material distributed very far ahead of the construction gangs, and at this time horse-drawn sleighs have been used to advantage on short-haul work.

Three light tractors complete the motor equipment. These are used for pulling scrapers in backfilling tower foundations, stringing the transmission line wires, sawing wood, driving water pumps and sundry other useful operations in connection with the line construction.

The above illustrations show how earth boring for tower footings is facilitated in quicksand by removable barrel.

1. Lowering the barrel with crane on caterpillar tractor; crane is also used in lowering anchors and leveling footings.

2. Complete tower erected in eight hours by eight men by this method.

3. A 42-in. hole being bored for tower footings with earth-retaining barrel in place.

4. Tower footing has been set and barrel is being removed; note the quicksand in the removable barrel.

Machine Building of Transmission Line

Spans of 880 Ft. Found Most Economical for 120-Kv. Double-Circuit Loop Around Detroit—Only Two Types of Towers Used—Earth-Boring Machine to Make Anchor Excavations

By HAROLD COLE
Distribution Engineer Detroit Edison Company

IN ORDER to provide more adequate and reliable service to the suburban territory surrounding the city of Detroit and to transmit the output of its new Trenton Channel plant into the city, the Detroit Edison Company is constructing about 150 miles of 120-kv. double-circuit steel-tower transmission lines. The operating voltage of 120 kv. provides a five-to-one ratio between it and the present system voltage of 24 kv., but line insulation, substation oil switches and other equipment were designed to carry 132 kv. The larger part of this new transmission system will be in the form of a half loop which will extend from the Marysville plant on the St. Clair River just south of Port Huron, Mich., to the Trenton Channel plant on the Detroit River, 20 miles south of Detroit. It will pass through the heart of the company's suburban area and will tie in through stepdown substations at several points to the 24,000-volt transmission system which at present supplies the local substations. The first link of this outer loop—a 52-mile stretch from the Marysville plant to the Bloomfield substation—has been in operation at rated voltage since October 1, 1923.

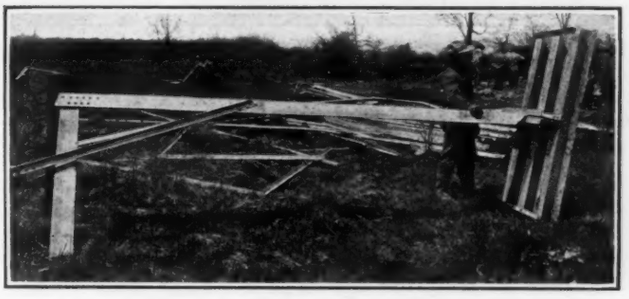
While the general characteristics of the line are not radically different from those in general use, it is felt that a number of features of design and construction are somewhat of a departure from usual practice and that they have contributed to a saving in cost without sacrificing the requirements for dependable service.

LONG SPAN CONSTRUCTION USED

One of the notable features is the use of long spans of copper wire. A study to determine the most economical span for the size of wire selected, namely No. 3/0 hard-drawn copper, favored very strongly the use of a span of 880 ft. or more. While the amount of steel required for an 880-ft. span was about the same as that required for the shorter spans, the saving in excavations for foundations and in expense for insulators and easements was considerable. Therefore a tower having a height of 61 ft. to the lowest conductor was decided upon. This height would allow a span of 880 ft. on level ground, with a conductor sag of 33 ft. and a ground clearance of 28 ft.

While this sag may seem rather large, no disadvantages have been discovered and some distinct advantages which were not at first fully appreciated have developed. For instance, if a ground clearance greater than 28 ft. is required, it is usually only necessary to shorten the span slightly. Even this procedure is not necessary when the extra clearance is required over only a short distance, such as at highway crossings, if one tower can be built fairly close to the point where the extra clearance is needed. As a result very few towers of special height are required. The character of the country traversed by the lines is particularly adapted to this long-span construction, being generally level. One stretch of 13 miles was built through thickly settled country with every tower of standard height.

Towers of the conventional square-base design are used and only two types are employed—the type A "suspension" tower, weighing about 7,500 lb., for straight-line work, and the type B "strain" tower, weighing about 12,500 lb., for angles in the line up to 45 deg., and as storm towers placed every two miles in straight sections of the line. Dead-ends were avoided as much as possible, special-arm construction being employed at angles to allow the strain to be taken on single strings of insulators. At storm towers a single suspension string is used with a special heavy-grip clamp capable of holding the conductor up to the elastic limit.

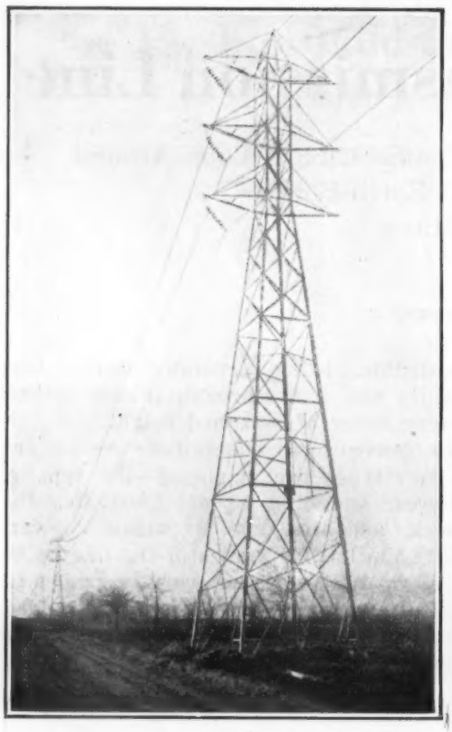


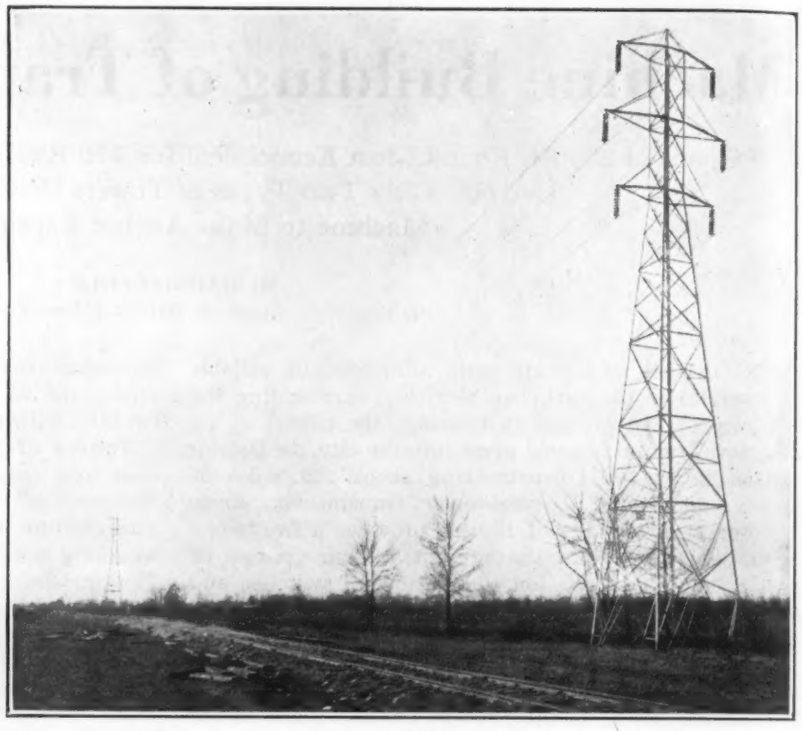
GRILLAGE FOR STRAIN TOWER FOOTING

This practice, together with the use of long spans, has resulted in a considerable reduction in the number of insulators compared with those used on most of the lines built earlier. At the same time the working stresses on the insulators have been generally reduced. Since insulators, particularly those which are subjected to heavy mechanical stresses, are generally conceded to be points of potential trouble, it is hoped that these lines will give a very good account of themselves on insulator performances.

The method of excavating for the foundations of the towers is probably the most interesting construction feature. The tower footings or anchors were specially designed to facilitate the use of earth-boring machines. Such machines had been used by the Detroit Edison Company several years for setting poles in its wooden-pole transmission lines, and it seemed very desirable to make use of the same equipment for the tower-line construction. Consequently the tower manufacturer was asked to design a steel footing which would be suitable for use in a round hole and which would be as small as practicable.

When it was found that a steel grillage approximately 40 in. in diameter was required for the type A tower, the scheme looked rather impracticable, as the largest





TWO STRETCHES OF DOUBLE-CIRCUIT 120-KV. STEEL-TOWER LINE
At Left—Suspension tower. At Right—Tower for angles of 5 deg. to 20 deg.

hole attempted before was 30 in. in diameter and the manufacturer of the boring machine would not recommend trying to bore a hole of the size required. However, a machine was equipped with a 42-in. auger and after a little development work was made to operate very satisfactorily. It was impossible to design a 40-in. diameter footing for the type B tower, and a steel grillage 2 ft. 6 in. wide and 6 ft. long was decided upon, so that two 42-in. holes could be bored side by side and the earth between them removed. It was also necessary to make some changes in the boring mechanism to permit the lengthening of the shaft on the auger so as to dig much deeper holes than were possible before, as the type A tower footings had to be set in the ground 9 ft. 3 in. deep and the "B" tower footings 12 ft. 6 in. deep.

Although it is rather difficult to determine just what would be the cost of setting the usual design of footings for the towers used, it is felt that the use of earth-boring machines on these lines has resulted in a considerable saving. Under favorable conditions it has been possible to bore the holes, place the anchors and backfill the holes for four type A towers in one day. One set of footings for type B towers has also been completed in one day. This work was accomplished with a crew of only ten men, while the same work done by hand would have required at least four or five times that number of men. It is obvious that the working force required to build a line is greatly reduced by this method of excavating. This is a very important consideration where it is difficult to get cheap common labor, and it has the further advantage that it is not necessary to provide construction camps for the men, as the smaller gangs can find room and board without difficulty.

Of course, footings are not always set at the rate mentioned, but when bad digging conditions are encountered the boring machine is not slowed up as much as hand excavation would be. For instance, where quicksand is encountered, a steel "sand barrel" is used in setting the type A tower footings. This "barrel," made of two half cylinders, arranged so that they may be locked together to form a complete cylinder slightly larger than the auger, is sunk in the earth as the auger progresses and prevents the sand from caving in around the hole. The loose sand held in suspension by the water is not removed entirely, but is no impediment, for when the auger has reached the required depth the anchor is dropped quickly into the hole and sinks to the bottom through the loose sand and water. The rods locking the two halves of the cylinder are then pulled out, and the partial collapse of the "barrel" permits it to be removed quite readily.

Another advantage of the machine method is that construction may be carried on in winter weather to much better advantage than with hand excavation. After the frozen earth has been removed from the top of the hole by hand the machine is able to bore the rest of the hole in a few minutes. The anchors can be set and backfilled before the earth has a chance to

COST OF 120,000-VOLT STEEL TOWER LINE
Double-Circuit No. 3/0 Copper Conductors

Material	Cost	Cost per Tower	Cost per Mile
Supports			$2,280.00
311 Type A towers	$91,420	$294.00	
36 Type B towers	17,280	480.00	
Extensions, angle and transposition arms	8,125		
Conductors, No. 3/0 copper			2,890.00
Insulators			815.00
Hardware			75.00
& Labor and Overhead			
Clearing right-of-way			207.00
Hauling steel			152.00
Installing anchors			456.00
Type A		50.25	
Type B		217.70	
Erecting towers			375.00
Type A		48.25	
Type B		117.30	
Stringing wire			242.00
Engineering and supervision			238.00
Overhead charges, including general overhead, interest during construction and interest and depreciation on earth-boring machines			1,420.00
Total cost per mile			$9,150.00

freeze even in the coldest weather. During the past winter construction work on the 120-kv. lines has been carried on almost as rapidly as was possible in summer weather.

The earth-boring machines used for this work are mounted on caterpillar tractors and are therefore able to travel under their own power in almost any kind of soil condition and to maneuver very readily in restricted spaces. Each caterpillar is equipped with a wishbone crane operated by a power-driven winch, an equipment which proves very useful in placing the anchors in the holes and leveling the footings. The latter operation is accomplished by means of a setting template and a surveyor's level. The template is made of angle iron with a splice plate in the middle of each side so that it may be separated into four parts. This facilitates transportation in the field, makes it possible to attach the template to each leg independently and has the further advantage that for extension towers it is only necessary to use a longer splice plate. The holes are dug to approximately the same level by checking with a surveyor's level the elevation of the top of the auger shaft. Then, with the template in place, the levels of the corners are taken and the high anchors driven down with bars and the low anchors brought up to the proper level by lifting the anchors, backfilling and tamping. After the exact level has been reached, backfilling of the holes is completed and the template removed.

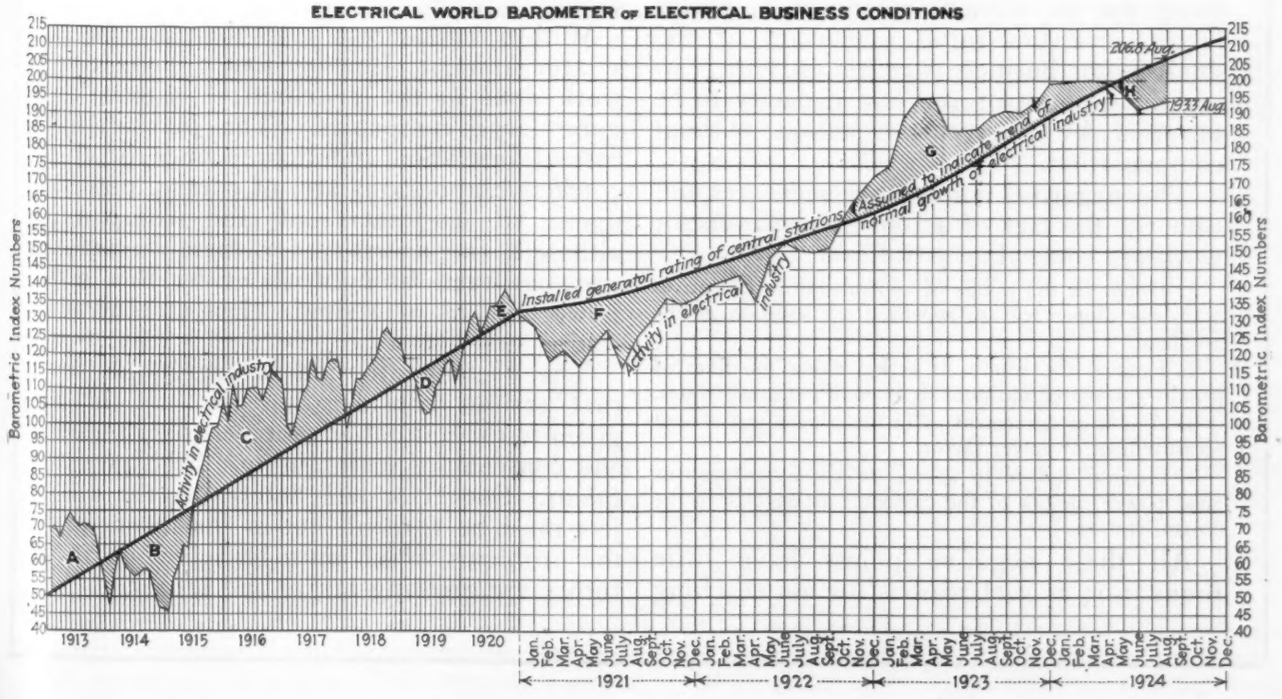
Towers Erected in Place

The question of the best method of erecting steel towers has been the subject of considerable discussion of late; the answer probably depends upon the conditions. With towers of the height selected for the lines under discussion (90 ft. over all) any equipment required to raise the completely assembled tower from the prone position would be quite heavy and cumbersome, especially if it were designed to raise both types of towers used. Furthermore, with this method of erection it is necessary to carry a large supply of timber for blocking up the towers during the assembling. On the other hand, the equipment necessary to assemble the towers in place is very small and may be easily carried by the assembly gang from tower to tower. In consideration of these advantages and the fact that the towers are nearly all in cultivated fields, where the unavoidable injury to growing crops might result in large damage claims, it was decided to try out the latter method first. A number of experienced tower erectors were available, and these men soon became so proficient in assembling the towers in place that no other method was attempted. A gang of eight men equipped with only four sets of blocks and a light wooden gin pole were able to build up a complete type A tower in less than eight hours. It is difficult to imagine how the same gang could do much better than this by assembling the tower in the prone position. Besides, the elimination of an extra set of erection gangs has very obvious advantages.

August Electrical Business Activity on a Par with July

FIGURES upon which the "ELECTRICAL WORLD Barometer of Business Conditions in the Electrical Industry" are based indicate that during August business activity was virtually on a par with July. The electric light and power branch of the industry was operating slightly below the estimated normal during July for the first time since August, 1922, and incomplete returns indicate that the subnormal activity in this branch of the industry continued through August.

An increase during August of 1.4 points on the barometer scale, as compared with July, is shown. During the interval the industry grew 2.0 points, making a net increase in activities of 0.6 point on the barometer scale as compared with July. The electrical industry as a whole was, therefore, operating during August at 12.9 per cent below what would have been the point of seasonal demand if growth in the industry had been normal. In July it was operating at 12.3 (revised) per cent below, and in June at 10.2 per cent below, the point of normal demand.



The Present Power-Factor Situation

By Charles J. Russell
Vice-President Philadelphia Electric Company

THE gradual introduction of power-factor clauses in central-station schedules of rates has indicated some recognition of the importance of the subject. At present, however, it may be said that a general condition of apathy exists in regard to this matter throughout the industry and that very little constructive work is being done toward the solution of existing problems in power-factor control.

Power-factor clauses now exist in the rate schedules of a hundred central stations. Investigation of the form and operation of these clauses shows a great lack of uniformity in the bases upon which they are formulated. In the majority of cases where penalties are provided for low power factor they are not enforced and the clauses are considered as a police measure to be enforced at will.

In the meantime motor loads are increasing by leaps and bounds, and it must be anticipated that the power-factor situation will daily become more general and more serious. In many cases new business is being put on without reference to power factor, and the rapid expansion of the small-motor business is continually increasing the amount of reactive capacity to be supplied by the central station without compensation.

The negative points that seem responsible for the lack of action in power-factor work are somewhat as follows:

1. Doubt in the minds of central-station executives as to the proper way to approach the solution of the problem.
2. Fear of the results of action along the lines of penalties or bonus additions to schedules of power rates.
3. A lack of agreement as to the proper methods of measurement of power factor.
4. General failure to appreciate the importance of good power factors to the customer as well as to the central station.

All these negative points have little foundation as real reasons for not reaching an agreement in handling power factor. The engineering phases of the power-factor question are well understood. The cause is well known, and the results, while not the same in all systems, are well understood, although the cost due to low power factor and the cost of correction must be calculated by each individual company. The correction of low power factors is well understood, and the investment and operating costs of the various methods of correction may readily be calculated for a system, a part of a system or for any individual installation.

Within a year or so there has appeared upon the market a motor which operates at unity power factor and which may supply sufficient leading current to correct to a certain degree a low power factor existing in the same installation. Announcements have also been made relative to high-power-factor motors which are being put out by other companies. These motors should be investigated and receive the interest and support of the whole central-station industry.

Within the last two years there has been a large amount of power-factor corrective work done in the distribution systems of some large companies. The investment, cost of operation and maintenance of the corrective apparatus are, of course, placed upon all customers of the company, although the necessity for these items of cost has been brought about by the bad power factors of a single class of central-station customers.

The present situation is regrettable in that serious consideration has not been given to the mutual advantages to customer and company of maintaining a high power factor. Sooner or later interest in the subject must be revived, but in the meantime the problems which must be solved in the future are growing larger and larger.

Poland Building an Electrical Industry

Many Projects for Erecting Generating Stations, Both Steam and Hydro—Developments in Manufacturing—Electrifying Industry and Railways—Foreign Capital Being Invested, with Government Going Into Partnership

Special Editorial Correspondence of the ELECTRICAL WORLD

WARSAW, POLAND, Aug. 1, 1924.

POLAND today is doing her best to build an electrical industry not only in generating stations and transmission lines but also in manufacturing plants. Compared with American figures her developments are not large. But compared with what Poland has done before her program is comparatively ambitious and she is making significant headway. There are a number of electrification projects under consideration or actually under way, and two of these at least are of considerable proportions. Her manufacturing had to be built from almost nothing, but progress is being made.

THE GENERAL SITUATION

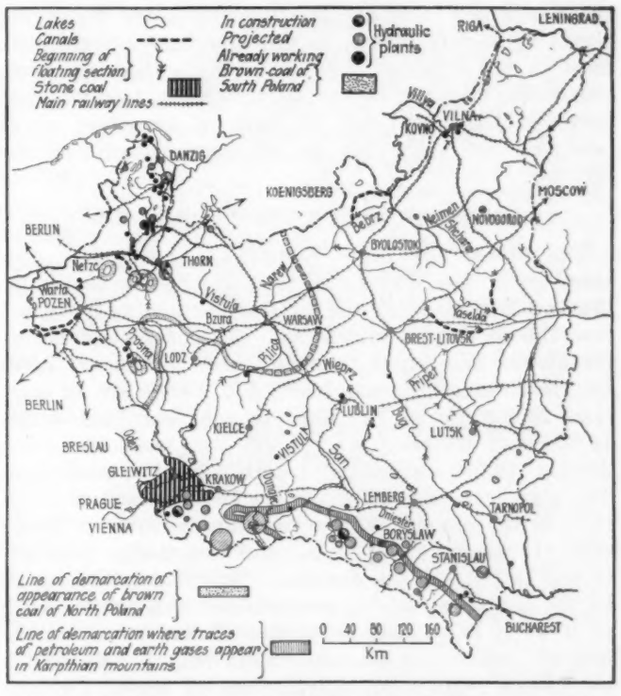
Poland, as is known to all who followed the political changes in Europe after the war, is made up of three parts—one, by far the largest, being taken from former Russia; a second being taken from eastern Germany, and a third being taken from northeastern Austria. Politically, after the century-long period of dismemberment, she had serious problems in pulling herself together into one country, and she was seriously handicapped in an economic way as well. Add to this the Bolshevist war with Russia and internal troubles of her own, and it will be seen that there was plenty to keep the Poles busy in constructing a unified country. Very largely this has now been done, though it must always be recognized that while the Pole is naturally more stable than the Russian he is less so than the Englishman or Scandinavian.

The Polish mark has a history which almost approaches that of the German mark, but within the past year a new currency based on the "zloty" (worth 19.30 cents at normal exchange) was established, and this has remained virtually at normal since its establishment. There is not an oversupply of currency and prices are now high. But that is a stage which should be passed before long.

Eastern Poland is still in a rather devastated condition—many of the old Polish or Russian refugee peasants living in dugouts in the old war trenches and amid barbed-wire entanglements. Western Poland—former eastern Germany—is very much better organized. Cracow, which is Poland's Pittsburgh, is quite busy. Warsaw, a city of a million, hemmed in as a Russian city by Russian forts until the density of population was 50 per cent higher than that of the city of St. Petersburg or the city of London, and therefore the highest in the world, is now commencing to spread out. Suburbs are growing and the city is becoming modernized in many ways.

CENTRAL-STATION DEVELOPMENT

The Association of Polish Power Plants estimated last year that the total investment in electric power plants in Poland exclusive of transmission lines was about twelve million dollars. This investment covers some 224 plants, fifty-seven of which (34,000 kw.) are in former Prussian Poland, 142 of which (58,000 kw.) are in former Russian Poland, and twenty-five of which (30,000 kw.) are in former Austrian Poland. Of the eighty-one power plants belonging to the association, "seven may be classed as large . . . with an aggregate production [rating] of 84,844 kw." Thus the average plant in Poland today is a very small affair, and the total utilization of power averages not more



MAP OF POLAND, SHOWING LOCATION OF NATURAL RESOURCES AND SITES OF WATER-POWER PLANT DEVELOPMENTS OPERATING AND PROJECTED

than 7 kw.-hr. or 8 kw.-hr. per year per capita. In former Russian Poland almost all of the plants are privately owned, in former Prussian Poland about two-thirds are municipal and one-third private, and in former Austrian Poland about 75 per cent are municipal and 25 per cent private. On a national basis, about 60 per cent of the total power installed is privately owned and about 40 per cent communal or municipal plants. For the most part, Polish power plants depend on coal, though there is some generation with coke, a little with crude oil and a certain amount with wood and peat (at least 6,000,000 kw.-hr. was produced with wood in 1922, the last year for which definite data exist or are available). The industry still suffers from very high line loss for two reasons: A majority of the plants produce direct current at low tension (220 volts to 440 volts), and the lines in many cases are made of iron, largely as a result of iron being substituted for copper during the war. Another inter-

esting fact is that the development up to the present time has been such that more than 80 per cent of the electrical energy generated is used in industry and less than 20 per cent in lighting.

But in a country of thirty million people, with a lumber industry, a textile industry and a tanning industry, with coal mines and extensive oil fields, and with a program of railroad electrification under consideration, the opportunity and necessity for development of generating systems on a modern scale is quite apparent. There are at least a dozen electrification projects in various parts of Poland, but two of them seem to be of more substantial size than the others and to be making substantial progress. These are the plants of the Polish "Elektrobank," or, in Polish, Bank dla Elektryfikacji Polski, and of the "Power and Light Company," or, in Polish, Sila i Swiatlo. The development system in vogue is to work under a "concession" from the Polish government which gives monopolistic privileges in the territory covered by the concession. In cities in which there are existing plants, the municipal plants or private plants, as the case may be, are confined to the original city limits or to the small-area concession and the larger electrification projects can surround these and sell to them, if necessary or if possible; but there can be no competition between the two.

TERRITORY OF TWO CHIEF COMPANIES

The Power and Light Company's principal concessions are in the Warsaw district, completely encircling Warsaw and including the territory extending to Zyrardow (about 86 km. southwest). The present plants of the Power and Light Company are: Proskow, 7,500 kw., now operating, peak load 7,500, 10,500 kw. in erection, 25,000 kw. to be added in one year; Sosnowice, 10,000 kw. installed with 7,500 kw. peak load, and Siersza, 10,000 kw. installed with 6,200 kw. peak load. The plan is to connect these stations and others to be built in the district with a transmission line at 35,000 volts, three-phase, 50-cycles, and eventually, possibly, to sell to the Cracow district. This district seems to be the aim of all of the companies which are in reach of it as it is a good prospective power user and the present capacity in Cracow (municipal) is only 15,000 kw. Lodz, with a municipal plant of 20,000 kw. and Byolostok, with 2,500 kw. (municipal) and 2,500 kw. to be added, are also future markets for a larger system.

This concern is financed very largely by English capital, by interests connected with the English Electric Company, and English Electric Company equipment is being used. There was a recent loan of £1,250,000 for a twenty-two-year period at not to exceed 6 per cent, and this company claims it has an option on an additional £1,250,000—this being enough to finance all of its plans for the immediate future.

The Elektrobank's principal concession territory lies in southern Poland, or Galicia, where the entire development will ultimately be water-power. At least 1,000,000 hp. is said to lie easily available in the Carpathian mountains. A 5,000-kw. station is building at Myczkowce on the River San, and at another location on the same river a 10,000-kw. plant is just being begun at Lukawica, and a third project, construction on which is to start next year, is at Roznow, with 30,000 kw. These stations are all being connected by a transmission line at either 100 kv. or 150 kv. with Cracow (150 km. distant) in mind as one principal user. There are some excellent storage reservoir sites in the Carpathians, one of which will hold 100,000,000 cu.m. with a 30-m. head. There are paper factories, munition works, textile factories, etc., in this district, all of which are planning to use electrical energy when the development is completed, and this is also in the region of oil fields which it is proposed to develop with electrical energy. Money for this enterprise is being obtained largely through French capital (the Bank of France and Holland), with a first loan of about 25,000,000 gold francs. An entirely separate company has been formed for the purpose of owning the transmission and distribution system. French equipment largely is being used here although some Ganz turbines and electrical equipment are also installed.

These two companies are typical, though probably the best, examples of the actual situation in connection with projects now under way in Poland. They are working co-operatively in some cases, too. Both of these companies are building electric interurban lines out of Warsaw to take care of the expansion of the city into the suburbs and also to carry the workers who live in Warsaw to the industrial factories surrounding the city. They have what is to them a serious commuting problem, with an extremely heavy morning rush hour, and new electric lines are being constructed to help in this situation. At present full dependence has to be placed upon what commuting service the trunk-line railroad can give. In addition to interurban electrification, a government tunnel for the railroad is being built under Warsaw; this will also be electrified.

Coupling the railway electrification with the evident and active desire of industry to be much further electrified, and also with the opportunity to develop the use of electricity in the home—a field practically untouched except for a few pendent lamps in some of the residences—those interested feel that there is a real opportunity for electrical development.

GOVERNMENT ATTITUDE

The Polish government has established a Department of Public Works, under the electrical division of which electrification projects come. It is not exactly a regulating body, but is rather a body to grant concessions and to determine with the concessionaire the area of the concession and also the rate. The concession provides for regular rates and also provides ways to modify them. The government maintains indexes of cost of operation of power stations, and prices vary according to these. Concessions are granted for terms of different length, depending upon the nature of the company. Usually the terms are for a multiple of ten years, thirty, forty, fifty, etc. The law says that concessions *may* be given on the basis of the community buying the plant at the end of the term of the concession, the figure to be determined by a regularly constituted commission. But it is not expected that anything will be done under this clause. Poland as a nation endeavors to encourage foreign investment, and plans for electrifying the oil fields in Galicia have been initiated by the government. The government has so far given no guarantees to foreign capital, although it has in instances exempted power corporations from all taxes and other fiscal charges for at least five years from their establishment as another help to them to get a good start. On the other hand, the government makes no

limitation on the rate of return which may be earned by capital invested. The government encourages electrical development, supplies information as to where to locate in order to obtain the most economical power, studies advanced methods and is ready to supply the power plants with information. It has definite rules as to standard voltages, 3,000, 6,000, 15,000, 35,000, 60,000 and 100,000, with working voltages for direct current, 110, 220 and 240, and for alternating current, three-phase, 110, 220 and 380. A frequency of 50 cycles is obligatory.

The government is definitely encouraging water-power production even to the extent of supplying 51 per cent of the capital, but it leaves the running of the business in private hands. It is already proposed to sell its interest in one enterprise in which it entered (Szczawnica-Jazowsko), because it believes this company is now substantially under way and that government capital should be used to help get enterprises started and not to keep them operating after they can get on their own feet.

Although no American capital has gone into any of these enterprises as yet, the Poles who were questioned on this subject said they felt that American capital should be attracted by some of the possibilities and that it would be welcomed.

Electrical Manufacturing

Before the war electrical manufacturing in Poland was virtually non-existent. The political and economic condition of Poland in its various parts under Russia, Austria and Germany was, of course, the reason for this. But since Poland became independent there has been a rather extraordinary development of the electrical industry in manufacturing lines—at least of small materials. Compared with American sizes, again the Polish sizes seem small. One plant, for example, has about 150 workmen, who produce motors up to 30 hp. regularly and on special orders up to 82 hp., the monthly production amounting to about 500 hp. or 600 hp. Another plant produces forty-five to seventy small motors per month. Other plants produce, in one instance thirty or forty motors per month, in another somewhat less, while in a third case 200 motors were turned out in 1922. In lamps Poland is a little farther along. The Cyrkon factory and the Philips factory, both in Warsaw, turn out each about 5,000 lamps daily and there is actually some export of lamps. There are a few switch and accessory factories, one or two manufacturing wire and cord and one or two manufacturing electric flatirons, fans, heaters, wiring supplies, lighting fixtures, etc. But Poland is not yet ready to manufacture the equipment necessary for the electrification of her industries, and there is a call for switching equipment, regulators, circuit breakers and also motors, although naturally in comparatively small amounts. The imports, for example, in 1923 were 5,341 metric tons of "dynamos," with a value of about $3,000,000, and 8,626 metric tons of other electrotechnical articles, with a value of about $5,400,000. This, however, was an increase of about 60 per cent over 1922.

In addition to a desire for American capital, Poland also has a desire for American electrical goods. There is complaint that the American manufacturer does not know how to trade with Poland—he must have a Polish agent and he should handle his goods on a consignment basis, at least in all cases except where the time element of shipment is large anyway, as with extremely heavy machinery. The Pole also complains that business has to be developed in Poland for the American manufacturer almost in spite of that manufacturer, as he will not take the initiative in finding out what sort of a market is there. The Polish people interested in electric development are rather put out that some of the larger American electrical manufacturers have more or less "parceled out" Poland to German manufacturers and are staying out of the field themselves. To recognize exactly what this means it must be said that the Pole sincerely hates the German as well as the Russian and does business with him only when it is necessary. Parenthetically, it should be said that the creation of another "language island" in Europe is naturally not going to be conducive to the best of relations with contiguous countries. The Pole will not talk Russian or German if he can possibly avoid it, but has set up his own language—certainly the next to the hardest in Europe—and he thus creates an island for himself so far as easy communication goes.

It would not be right to say that Poland is a country where riches can be acquired quickly in electrical industry. But it does appear that with thirty million people and an average consumption of only 7 kw.-hr. or 8 kw.-hr. per annum per capita, with all the natural resources of the nation, with an industry seeking to be electrified, with interurban railways being built and a definite plan for beginning to electrify state railroads, and with water power available in the Carpathians, there is a situation which at least will bear examination on the part both of American capital and of American manufacturers.

H. V. BOZELL.

Demand for Electrical Energy Increases Steadily in Italy

ALTHOUGH complete statistics of the consumption of electrical energy in Italy are not available, the Association of Italian Power Companies compiles annual data in this connection which are very near the truth and are extremely useful for purposes of comparison, reports Commercial Attaché H. C. MacLean from Rome to the Department of Commerce. However, in publishing these figures the association points out that they relate entirely to the consumption of users of electrical energy and must, consequently, be considered at least 20 per cent smaller than the production. During the fiscal year 1922-23 the total consumption is placed at 5,401,000,000 kw.-hr. as compared with 4,302,000,000 kw.-hr. in 1921-22 and 4,252,000,000 kw.-hr. in 1920-21. Of this total, 4,929,000,000 kw.-hr. were utilized for power and only 472,000,000 kw.-hr. for lighting.

While the consumption for lighting has been steadily increasing, especially since the war, owing to the almost complete abandonment of gas lighting, the increase in the consumption for power has recently been even more rapid and the percentage of energy used for lighting declined from 10.7 in 1921-22 to 9.6 in 1922-23. The average per capita consumption for the country, excluding the new provinces, was 146 kw.-hr. in 1922-23, but this average is misleading, for while the consumption in the northern provinces is exceptionally large, having reached the maximum of 483 kw.-hr. in Liguria, in Calabria it is less than 5 kw.-hr. In Piedmont, Lombardy, Liguria and Umbria an average per capita consumption of 385 kw.-hr. is recorded.

Energy Interchange with Central Stations

Association of Iron and Steel Electrical Engineers Feature Developments in the Application of Electricity to Their Industry — Economical Use of Power — Electric Heat Opportunities — Improvements in Drives

THE nineteenth annual convention of the Association of Iron and Steel Electrical Engineers, held in Pittsburgh, September 15-19, was unusually successful and unusually worth while from the standpoint of the quality of its technical sessions. The topics were well selected and well presented and dealt with a diversity of subjects of interest to all electrical men. The exhibits of nearly sixty manufacturers of equipment were well patronized and a general feeling of enthusiasm and optimism prevailed.

At a business session on Monday morning various committee reports were heard and the special bearing committee, D. M. Petty chairman, recommended that the association pass a resolution notifying the Power Club that it believed the 300 series of bearings should be standardized for ball and roller bearings in so far as inside and outside dimensions are concerned.

Roll Drives Discussed

At a technical session on Tuesday morning L. A. Umansky discussed main roll drives with particular reference to adjustable-speed requirements. He urged the necessity for definite engineering analyses before drives were selected and that costs be based on tonnage of product only. In his opinion there was a field for all existing types of drives and the selection of an individual type depended on the job requirements. The simple induction motor was admitted to be the best constant-speed drive and was also well suited as a two-speed machine. But when adjustable speeds were required many modifications were necessary on the drive and the cost of equipment increased from 50 per cent to 100 per cent.

In an analysis of alternating-current adjustable-speed drives he classified them as constant-horsepower or as constant-torque, depending on whether the slip energy is returned to the main shaft or to the line. Either the Scherbius or the Kraemer system could be used as a constant-horsepower or constant-torque application. He discussed frequency-converter systems and direct-current systems and drew some general conclusions which may be summed up in the statement that alternating-current drives should always be used except where job requirements make direct current necessary. The reasons given were as follows:

1. The alternating-current drive has greater efficiency.
2. The alternating-current drive can be corrected to operate at unity power factor.
3. With alternating-current drives in isolated mills, first cost and maintenance costs are less and operation is easier.
4. The larger the capacity of the drive, the greater the advantages appertaining to alternating current.

The direct-current drives have applications where a large number of speed steps are required, where very close speed regulation is desired and where the use of several mills may result in a lower first cost.

In comparing the Scherbius system with the Kraemer system, the author asserted that the Scherbius has some advantages in that it can use a double-speed range and uses one less machine. A new development yet to be tried in the fire of practice is the building of two 600-hp. brush-shifting alternating-current motors for the Halcomb Steel Company. One of these has been placed in operation recently and so far has given good results.

In a discussion of the paper, F. B. Crosby and others complimented the author and advocated better engineering analyses to drive applications and the use of a long-time perspective in the selection of equipment, because of the rapid increase in the capacity demands on steel mills.

Combustion Control

A good paper on combustion control was presented by E. G. Bailey at the technical session on Tuesday morning. He emphasized the necessity of controlling air, fuel and draft instantaneously and in an amount that will give capacity and efficiency on each unit. The main argument of the paper is as follows:

There is only one correct way to regulate anything, and that is to move the various controls the necessary amount in order to obtain certain definite results. The illustration on page 679 represents diagrammatically a steam-boiler plant involving three controls for the combustion process—namely, fuel, forced draft and induced draft. To operate this plant satisfactorily these three basic controls must be guided by certain definite results. The first of these is steam pressure. Steam pressure is an indication of balanced relation between the inflow and outflow of B.t.u. from the boiler proper. When the steam pressure holds constant it indicates an exact balance. When the steam pressure is dropping it shows that the steam is carrying heat out of the boiler faster than the fuel is replenishing it; therefore the call for a higher rate of combustion. To supply this heat from coal or fuel in any form requires air, or in the case of a fuel bed if the coal is already on the grate, then the supply of air will be sufficient, but burning away of the coal calls for a replenishment of the fuel in order that the desired fuel-bed conditions may be maintained. A drop in steam pressure, therefore, calls for simultaneous increase of both the fuel and air supply. In the case of stokers with fuel beds the need for this exact synchronism of events is not so essential as it is in the case of pulverized fuel, gas and oil.

Relation Between Fuel and Air

The second problem of control is the relationship between the fuel and air in order to maintain combustion efficiency. The relationship between fan speed or damper position and air supply is not at all accurate. The relation between stoker speed, feeder speed, position of oil or gas valves does not hold a definite relation to the fuel supply. If these relationships did exist, then every valve, every rheostat and every damper would be a meter, and all that would be necessary would be to record or note their position, when the quantity of fluid or material passing through would be apparent. It is necessary as things are to search for a definite final result equivalent to the water level in the tank to guide in controlling the available speed or quantity-changing devices to obtain the desired relationship.

Experience has shown that the only feasible guide for combustion efficiency is to determine the percentage of excess air. The desired percentage of excess air for best combustion efficiency is that which will maintain the total losses due to excess air and unburned fuel at a minimum. Or, if the brick work is the essential factor, as it often is, one should maintain the lowest percentage of excess air and yet not encounter too great an expense in maintaining the brick work and furnace lining.

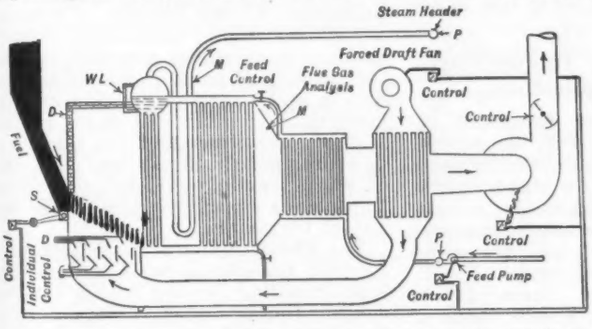
The steam-flow-air-flow relation is a positive, instantaneous and correct indication of the percentage of excess air and is well adapted as a guide for either hand or automatic control. The rate of steam generated is in reality the reading of a calorimeter showing the rate at which B.t.u.'s are developed in a furnace. The flow of air as indicated by the differential pressure across the boiler, with proper precautions, is a measure of the rate of air supplied to develop the B.t.u. Fortunately the B.t.u. per pound of air used in combustion is substantially constant for all commercial fuels, and the relation between steam flow and air flow is, in reality, a relation between the B.t.u. supplied to the furnace in the fuel and the air supplied to the furnace for burning it with the desired percentage of excess air.

Balance Between Induced and Forced Draft

The third factor for controlling this combustion process is found in the furnace draft pressure as being a balance

between the induced draft and the forced draft. In other words, this is equivalent to the water level in a tank where it is desired to take the gases out from the furnace as fast as the air-producing combustion is entering through the forced-draft ducts. Balanced draft control is well known and has been used to great advantage for a number of years, but every one realizes its limitations as it controls only one thing, viz., the relation between outgoing gases and incoming air, and has completely ignored the all-essential factor of controlling the fuel supply to maintain steam pressure and also to vary the air supply in proportion to the fuel for best combustion efficiency.

The system of control which must be carried out for best results is the same whether it is done by hand or automatic means. This involves simultaneous changing of the rate of fuel and air supply to meet the demand for steam, and then readjusting the induced-draft fan to obtain the desired percentage of excess air, and also readjusting the forced-draft fan to maintain the proper furnace draft. If the induced and forced draft have both been changed simultaneously with the fuel, they need only be slightly readjusted, using the excess air and the furnace draft as guides in obtaining the correct final adjustment. A good fireman, with hand control, does identically this very thing, and no system of automatic control will be successful unless it carries out the same procedure as a good man would do with good controllable equipment available for accomplishing any desired result called for as he observes the combustion and operating conditions.



FUEL, AIR AND DRAFT MUST BE CONTROLLED SIMULTANEOUSLY

He then described a typical installation of control to the pulverized-fuel installation of the Cleveland Electric Illuminating Company, where four 3,000-hp. double Stirling boilers burn pulverized fuel and operate to take the load swings on the station. The general princip'es of control are the use of pilot motors, the automatic control of all units for increasing capacity by changing fuel feed, the making of feed and damper openings simultaneously with steam-pressure changes, and the automatic correction of individual boilers for efficiency as guided by excess-air conditions.

W. P. Chandler said that the system had many points of value for use in the steel industry, where 200 per cent load swings are frequently encountered. Others pointed out the fact that stoker-fired boilers gave a reservoir in the fuel bed and that fuel-bed conditions often prevented full dependence on automatic control systems.

Furnaces and Heating

On Wednesday morning the subjects of electric furnaces and electric heat applications were treated.

The electric furnace committee (G. H. Schaeffer, chairman) made a brief report and sponsored three unusually good papers. In its report the committee says that within the melting limits now used commercially the electric arc does not cause a chemical combination of nitrogen with the steel bath and therefore causes no deleterious effects from nitrogen fixation. The committee also said that consideration was being given to the use of induction furnaces on a larger scale for producing high-grade alloys and for refining precious metals. "The field of the 'medium and low' temperature equipment is greater by far than that of the high-temperature arc-melting furnaces," the committee said. "The applications of this equipment cover a much wider range of product, and for this reason we find the equipment installed in greatly diversified industries."

The developments in electric melting furnaces are in the direction of decreasing the time between heats and of putting heat into the charge before the electric current is turned on, J. A. Seede asserted. The use of two-hearth furnaces of the turntable-type, the use of removable-top furnaces and chute charging have materially modified the time between heats. In the Schwindell two-hearth furnace, for example, the average time between heats is about four minutes. Mr. Seede also outlined developments in induction furnaces, saying that one in Pittsburgh had turned out a ton of steel every three hours for three-month periods without let-up. A 6-ton furnace of the induction type has also gone into operation in the Pittsburgh district. The speaker emphasized the economy and usefulness of the Soderberg electrodes.

The advantages claimed for these electrodes are: (1) Reduced cost per pound; (2) no devices are necessary to protect against corrosion; (3) reduced electrode consumption; (4) reduced delays due to electrode troubles; (5) independence of electrode manufacturers or transportation; there is (6) no reasonable limit to size and shape.

The saving claimed with these electrodes is 50 per cent over the non-threaded type, which would probably mean a corresponding saving over the threaded type of about 35 per cent. It is assumed that the figures given include all cost items. The other factors are also very much worth while and tend more than to balance the additional apparatus, operations and difference in practice.

The productive capacity of a furnace unit may be increased, shortening the time to produce a heat and decreasing the time between heats. To shorten the time of producing a heat means increasing the energy input to the charge, which, with a straight electric furnace equipment, means either increasing the transformer capacity or otherwise changing the electrical characteristics so that the metal will be melted with the least possible delay. Any method of decreasing the demand on the power supply, such as increasing the energy content of the charge by preheating, will shorten the time the metal is in the furnace and increase its production. The advantages of preheating are given as follows: (1) Time of melting is reduced 30 to 40 per cent; (2) power and electrode consumption are reduced in the same ratio; there is (3) no contamination of the charge as the metal is not fused; (4) electrode breakage and difficulties in starting are reduced on account of ease of maintaining arc on the hot metal; (5) higher melting speed is obtained through higher average power input on account of smaller current surges; (6) the number of heats is increased, which reduces overtime labor and increases profits with the same or greater tonnage output; there is (7) no increase in labor as the scrap is handled once only, from the scrap pile to the wheelbarrow.

Mr. Seede also considered electrode regulators, methods of reducing time between heats, charging machines, roof openings and multiple melting furnaces and gave a short discussion of the induction furnace.

In discussing the paper, George H. Schaeffer said that by tuning up electrodes and watching operations it had been possible to cut down the melting time twenty minutes per heat on one installation. A representative of the Soderberg electrodes said that there were thirty companies in the world now using this type of electrode, involving about 150,000 kw. capacity. He stated that the great value of the electrode was its adaptability to furnace needs and its decreased energy consumption. He told of a French plant making a high grade of tool and alloy steel which uses 33 lb. of electrode per ton of metal when supplied through a 1,170-kva. transformer, but this was reduced to 24 lb. per ton of metal when a 2,500-kva. transformer was used. Another engineer asserted that it was not fair to compare the poorly manufactured electrodes of Europe with American types and added that good American practice required only 15 lb. to 22 lb. of electrode per ton of steel melted.

W. E. Moore said that preheating with oil or gas was not always good practice and very seldom resulted in the saving of power assumed by Mr. Seede. Only heavy materials are heated in this manner, as highly oxidized light scrap cannot be heated. Another member stated that with a

two-furnace installation, using chute charging, there was only a five-minute interval between heats and the plant operated with an average demand of 1,042 kw. at 95 per cent load factor.

Medium Temperature Furnace Installations

The application of the various types of resistance heating furnaces in eight industrial plants was described by C. F. Cone. In these plants the following types of furnaces are being used: Regenerative car and counter-flow regenerative car, double-end car, rotaries, continuous conveyor, box and vitreous enameling.

A regenerative-car-type furnace in one plant has been operating virtually every working day since November, 1920, and has turned out several thousand tons of annealed wire, without a single rejection or reheating. All the inherent troubles of the fuel furnaces have been eliminated. Normally the furnace operates ten hours per day and an economy of 185 kw.-hr. per ton is obtained. During peak production it operates twenty-four hours per day and an economy of 115 kw.-hr. per ton is obtained. This latter figure gives practically 100 per cent thermal efficiency, or, in other words, the cold charge recovers from the cooling charge the equivalent of the radiation losses.

The plant management states that the cost per kilowatt-hour does not materially affect the unit cost of his product and that he would still use the electric furnace were his cost 3 cents per kilowatt-hour. The maintenance on the furnace is practically nothing. The actual figures are $25 since the furnace was installed nearly four years ago.

Double-End-Car Type

The economy of a double-end-car type in another plant is given as 340 kw.-hr. per net ton of transformer laminations annealed. In another plant a rotary furnace used for heat-treating automobile parts has given excellent results. When operating on hardening, the furnace heats 3,000 lb. per hour and the economy is 170 kw.-hr. per ton at 1,525 deg. F. At night the furnace is used for annealing and carburizing. A total of 18,000 lb. of carburizing boxes, packing and material is placed in the furnace at one time. This furnace fits in nicely with the straight-line production in the plant. Owing to the temperature control and uniform temperature distribution in the furnace chamber, rejections due to faulty heat treatment are eliminated. Absolutely consistent results are obtained day after day. Scaling has been reduced, and it is only necessary to give a flash pickle to annealed parts, whereas formerly the material was pickled for three or four hours. Smaller grinding allowances are permitted, thus saving material.

A large number of rotary electric furnaces are installed for heating various materials. This type of furnace lends itself to a large production of similar pieces. All installations show a big saving in floor space and a low labor cost, due to the ease of handling materials. They also readily tie in with automatic charging and discharging. Remarkable savings have been shown in all cases. One installation of a small 30-kw. furnace, selling for less than $4,000, shows a saving of $65 a day. This saving results from the electric furnace, operated by one girl, replacing seven to eight highly skilled operators.

Box-Type Furnaces

There have been more box-type electric furnaces installed than any other type. The sizes vary from the small laboratory furnace to the large-size working on a tonnage basis. Of particular interest is a box-type furnace operating in the heat-treating room of a large tube mill. This furnace is used for hardening dies. Before purchasing the equipment tests were conducted in a small electric laboratory furnace and results compared with tests conducted in an oil-fired furnace. These tests showed increased die life of 18 per cent to 20 per cent in favor of the electric furnace. A furnace 5 ft. 7 in. long, 27 in. wide and 2 ft. high, having a connected load of 60 kw., was purchased. Since this furnace has been in operation, it is evident that an increased die life of 33 per cent at least will be obtained.

Medium and Low Temperature Furnace Applications

Medium-temperature furnaces, according to a paper by E. A. Hurme, are used in the iron and steel industry for annealing sheets for stamping, for annealing and removing strains in castings, for annealing or hardening wire and for the hardening and tempering of steel parts and tool steel.

Medium-temperature furnaces are now on the market in a wide range of sizes adapted to nearly all industrial heating processes. The furnace chamber sizes vary from the bench type to the large car type annealing furnaces 20 in. high by 4 ft. wide by 15 in. long, and the load range from 1½ kw. to 2,000 kw.

Small-hearth-type furnaces are especially suited to applications requiring continuous temperatures not over 2,000 deg. F. Among the usual jobs performed in this type of furnace are the following: Annealing, hardening carbon steel, normalizing, case-hardening and pack-hardening, drawing temper of high-speed and alloy steels, vitreous enameling and laboratory applications.

One of the most successful applications of the hearth-type industrial furnace is in the treating of tool steel. Dies used in forming small parts by the die-casting process are subject to very high stresses and require special heat treatment. For this exacting work one company has adopted the electric furnace and finds that it not only gets better tops and saves effort in heat treating its dies, but actually saves $100 on each set hardened. It costs about $100 to make a set of dies, and as heat treating in the electric furnace more than doubles their life, the process saves the cost of a new set of dies.

Product with Electrical Equipment

With the electrical equipment this company is getting about one and one-half million tops from each set of dies. With the best gas-fired equipment it could not expect to get half as many pieces, and among the tops it would get there would be many more poor ones.

A car-type furnace for annealing castings is being used in the shops of the Canadian National Railways Company. The average charge treated is 5 tons and the average weight of the pieces treated is over 150 lb. The car-bottom-type electric furnace was chosen for the work because of its economy and the necessity for accurate control of the temperature. The following data show the input during a typical annealing cycle, treating coupler pockets to a temperature of 1,300 deg. F.:

Charge, Lb.	Time	Input, Kw.	Kw.-Hr.	Conditions
12,320	6 hr. 10 min.	221	1,360	Bringing charge to 1,300 deg. F.
12,320	1 hr. 0 min.	60	60	Holding at 1,300 deg. F.
12,320	Not stated	...	.....	Temperature allowed to drop to 1,200 deg. F.
12,320	1 hr. 0 min.	60	60	Holding at 1,200 deg. F.

The cost of power at 0.006 per kw.-hr. is 1.44 per ton and the cost of power for each pocket treated is $0.10. The production of the furnace is 8.34 lb. per kilowatt-hour. Other costs chargeable to the annealing operation include the handling of parts on and off the car bottom at $8 per charge. The cost of handling is roughly the same as the cost of power, bringing the total cost to approximately $3 per ton. The cost of power varies somewhat, depending on the class of material treated and the size of the charge.

The French Manufacturing Company recently replaced a wood-fired muffle-type annealing furnace with a 330-kw. electric furnace after a very careful investigation of operating costs and comparison of the metallurgical results to be obtained by both methods. This particular furnace is used for annealing seamless brass tubing.

Elimination of Guesswork

In the operation of the furnace all guesswork has been removed from the annealing process by automatic control not only of the chamber temperature but also of the charge itself. The two recording control pyrometers keep the furnace chamber temperature constant at any temperature from 1,200 deg. to 1,350 deg. F., depending on the temperature required for the material treated. A recording pyrometer with its thermocouple in the charge indicates the temperature at the center of the charge. About ten to twelve charges of from 1 ton to 1½ tons of brass each are annealed per twelve-hour day.

The power consumption averages 110 kw.-hr. per ton of brass annealed, or a production of 18.2 lb. of brass per kilowatt-hour. The cost of electric power exceeds the previous cost of fuel by only 7½ per cent, the saving in labor and time in the subsequent operations bringing the total cost of operation of the electric furnace below that of the old fuel-fired furnace.

A very important application of the low-temperature oven in foundries is in the baking of cores used for castings. One of the most serious troubles met with in foundries, causing defective castings, is the non-uniformity in the quality of the cores. An overbaked or

burned core will crumble and alter the shape of the castings. Castings with blowholes are caused by underbaked cores. With the accurate control of temperature possible in the electric furnace the trouble due to defective cores can be largely eliminated.

Another use of low-temperature heating in the foundry is in the heating of metal pattern plates. When moist molding sand is rammed up around a cold metal pattern a thin film of moisture collects on the pattern, so that when it is withdrawn from the mold there is a tendency for some of the sand to cling to the mold. Steel-clad heaters are used by the United States Radiator Company to keep the metal pattern plate at a temperature of 90 deg. to 100 deg. F., with excellent results.

Gordon Fox discussed roll heating and said that a complete plant using fourteen mills had recently been equipped with electrically heated rolls. More than twice the tonnage was being obtained on the first turn as compared to the use of warming irons.

Electric Heating with Special Reference to Central Stations

The surveys and estimates made by the industrial heating committee of the N. E. L. A. indicate that there is in this country today a connected industrial heating load of approximately 1,250,000 kw., which is roughly one-tenth of the total connected power load. Of this amount 1,000,000 kw. is connected to central-station lines, drawing therefrom an annual energy consumption of 2,000,000,000 kw.-hr. and producing an annual revenue of $40,000,000. (For details of report see ELECTRICAL WORLD for May 10, 1924, page 971.)

The foregoing statistics, according to a paper by E. D. Sibley, indicate the present development of electric heating. It seems that no general estimate of the possibilities in this business can be made with any degree of accuracy covering the entire country until local surveys are completed by the individual central-station companies, but it has been predicted that the heating load will ultimately be two and one-half times the motor load.

Both Mr. Sibley and Mr. Seede maintained that the controls and regulators now available made furnace loads desirable for central stations. Mr. Sibley stated that the Metropolitan Edison Company had 12,000 kw. heating load. Of this, 11,320 kw. was in furnaces operating at 90 per cent power factor twenty-four hours a day and the remainder in diversified applications and types. The load of 1,800 electric flatirons in the homes gave a noticeable Tuesday peak on the system.

On Thursday morning several papers were presented on miscellaneous topics. A discussion of electric repair-shop practice was led by A. C. Cummins. The general sentiment was that the elements of cost and time favor the use of repair shops in mills having old equipment, but that for new equipment it is best to have manufacturers make repairs. In all repair work the best possible job was advocated, and it was held that new equipment purchased should be the best obtainable. One member reported that over a period of twenty years in one plant the motor equipment had been increased 50 or 60 per cent and yet the repair force had been reduced one-half. Modern motors were reported to involve little if any repair.

Some developments in crane-hoist limit devices were reported in a paper by Walter Greenwood, but many improvements have yet to be made, he said, before entirely satisfactory conditions can be reported.

POLICIES GOVERNING INTERCHANGE OF ENERGY

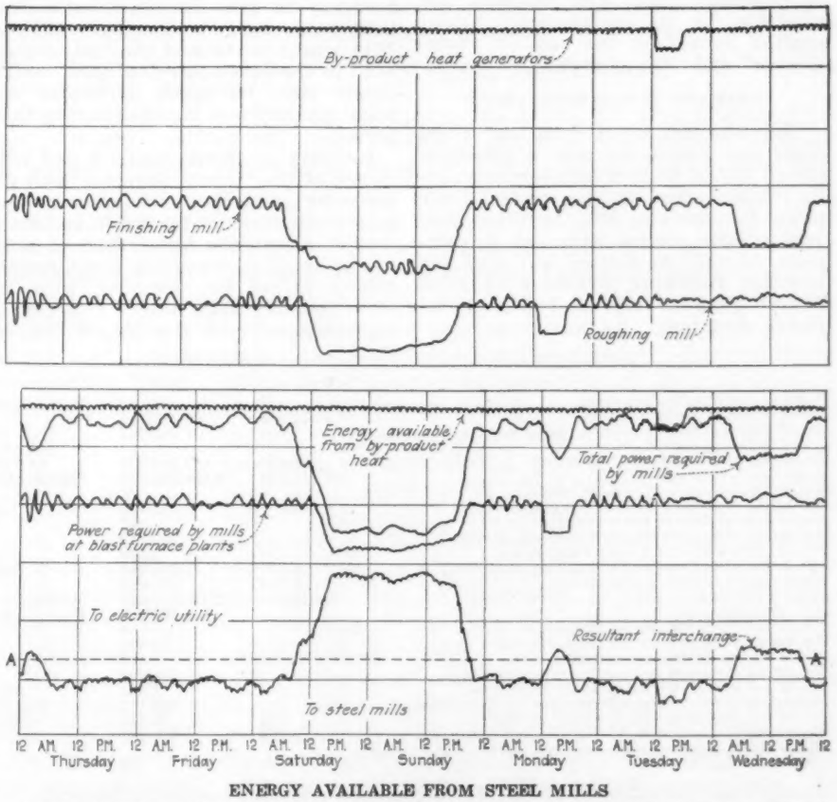
The economic and practical elements involved in interconnections between central stations and steel mills were outlined in a good paper by M. E. Skinner and F. D. Mahoney. Assuming a balanced steel plant, utilizing all its waste heat and completely motored, the authors found a big possibility for advantageous interchange of energy between it and a central station. Much saving and minimum of right-of-way trouble would be assured if energy for separated steel plants could be handled over the central-station transmission lines covering the territory. The greatest difficulty hampering the realization of all the beneficial possibilities seems, the authors said, to be the prejudice of steel men against central-station service and the proper adjustment of economic values for buying or selling power.

F. D. Mahoney said that the ideas in the paper had been carried out in several instances and cited the connection between the Alabama Power Company and the Tennessee Coal, Iron & Railway Company as an illustration. The steel company buys about 35,000 kw. from the power company and runs its waste-heat plants at full capacity all the time. The steel company gives its surplus energy to the power company during the week end, and this permits the power company to store water in the pools which furnish the water power used during the week. He said that interconnections in the Pittsburgh territory would soon give a power pool of 750,000 kw. for the use of the steel company connections. The ideas embodied in the paper were, Mr. Mahoney insisted, economically sound.

A. J. Standing said that the older ideas that central-station service was unreliable and the power costly were erroneous and that one of the chief troubles at present was that the central-station companies sell their power to other industries than steel mills because they pay more money. Barton Shover thought that interconnection would increase the load factor on steel-mill plants, thus permitting motorization at a minimum investment expense.

Power Data and Trends

The data on power used in the iron and steel industry were summarized in an able paper by Barton R. Shover.



ENERGY AVAILABLE FROM STEEL MILLS

Upper Chart: The top line represents the power available in a balanced steel plant. The second curve shows the power used by the finishing mill and the lower curve the power used by the roughing mill. Week-end layoffs are indicated and allowance is made for outages.

Lower Chart: The upper curves are the superimposed power curves of the steel mill. The difference between the energy available from the waste-heat plant and the total power required by the mill shows the power that could be given the central-station system. The area between curves shows the energy that could be transmitted by central-station lines between a blast-furnace plant and a finishing plant widely separated.

The lower chart shows the possibilities of energy interchange in more detail. Line *A-A* shows the probable condition existing in most steel mills where the energy taken from the central station (below *A-A*) is returned over the week end (above *A-A*).

For 1923, he said, the ratio of the horsepower of prime movers driving electric generators to the horsepower of motors installed is 0.59 to 1. A study of the data submitted by different companies developed the fact that the more completely the plant is electrified, the higher is the ratio between generator and motor capacity; in other words, the better is the load factor of the motor installation. Some of the older plants, where motors were used for cranes, tables, etc., only had a ratio as low as 1 to 7.

The constantly increasing application of motors since 1909 means that the generator capacity for 1919 was less in proportion to the installed motor capacity than it was in 1923 and very materially less in 1909, but because no data are available for these years, the ratio for 1923 is used in arriving at the figures for "direct power," although there is no question that the increase of direct power as shown is thus made considerably greater than was actually the case. "Other power" is assumed as being applied direct.

	1909	1919
Total plant power, hp.	3,277,698	4,770,489
Used to drive electric generators	472,723	1,134,856
Direct power	2,804,975	3,636,633

"Direct power" also includes power used for driving air compressors and hydraulic pumps, but the total amount is relatively small and no data are available for its segregation. "Total applied power" is the sum of "total electric" and "direct power."

Existing Power Situation

The Association of Iron and Steel Electrical Engineers sent a questionnaire to all of its firm members requesting information in regard to their power equipment, etc., for the year 1923. Some replies were not so complete as could be desired, but none the less the following summary of total figures gives a very good idea of the power situation:

	A	B	C
Number of companies reporting	5	67	18
Rated capacity, pig iron, tons	1,022,250	20,180,740	.....
Rated capacity, rolled products, tons	.....	29,150,085	.....
Rated capacity, castings, tons	.....	.....	884,280
Hp. capacity of boilers used for power	28,086	1,053,970	43,030
B.-hp.-hours produced	141,514,440	6,654,800,728	180,876,000
No. of engines driving reversing mills	.....	70	.....
Hp. rating of engines driving reversing mills	.....	288,656	.....
No. of engines driving non-reversing mills	.....	395	.....
Hp. rating of engines driving non-reversing mills	.....	542,203	.....
No. of engines driving auxiliary apparatus	36	2,744	102
Hp. rating of engines driving auxiliary apparatus	6,270	721,448	37,900
Kw. capacity of electric generators	6,366	531,831	22,030
Kw.-hr. produced	22,030,600	2,033,854,653	86,860,590
Kw.-hr. purchased	.....	426,105,990	116,333,006
No. of motors driving reversing mills	.....	8	.....
Hp. rating of motors driving reversing mills	.....	23,600	.....
No. of motors driving non-reversing mills	.....	497	.....
Hp. rating of motors driving non-reversing mills	.....	334,711	.....
No. of a.c. motors driving auxiliary apparatus	.....	7,382	847
Hp. rating of a.c. motors driving auxiliary apparatus	.....	325,132	24,233
No. of d.c. motors driving auxiliary apparatus	313	36,228	4,304
Hp. rating of d.c. motors driving auxiliary apparatus	7,906	930,632	34,039
No. of plants using no steam for power, all power purchased as electricity	0	12	8

Figures in the three columns of the above table are representative of:

A. Merchant blast furnaces not connected with steel works or rolling mills.

B. Plants consisting of blast furnaces, steel works and rolling mills, plants having steel works and rolling mills and plants having rolling mills only.

C. Steel foundries not connected with blast furnaces, steel works or rolling mills.

Although the questionnaire asked for production and a few companies gave that figure, the majority returned rated capacities; hence the figures given are neither capacity nor production, but are nearer the former than the latter. The figures giving number and rating of engines driving auxiliary apparatus include blast-furnace blowing engines.

Generation of Power

Practically all "primary power" generated in the plants comes either from steam or internal-combustion engines.

While reciprocating engines still compose the larger proportion of power units, the turbine is coming more and more into use. In 1909 the turbine was not considered of enough importance to be listed separately in the census report, but the 1919 report gives 955 units, aggregating 893,884 hp., or 21 per cent of the total steam power listed. Two manufacturers of turbo-generators report records of 334 units of their make, ranging in size from 300 kw. to 17,000 kw. and totaling 908,425 kw., as being in use in the iron and steel industry at the end of 1923. Of these, sixty-six, totaling 357,375 kw., or 39 per cent, have been installed since 1918.

The 160 per cent increase in the capacity of internal-combustion engines would alone indicate a very radical tendency in that direction, but conditions have changed. The years 1905 to 1914 might be termed the "gas-engine era" in the development of steel works power, since the major portion of the total capacity was installed during that period.

Increase in speed, capacity and efficiency of the turbine, together with its lessening cost per horsepower, has swung the tendency toward it, and close inquiry shows the installation of only five gas-engine generating units, aggregating 21,140 kw. capacity with no blowing units, since 1918. This capacity compared with the 357,375 kw. in turbo-generators previously mentioned as having been installed during the same period clearly shows which method of power generation is at present preferred. The advantage which the internal-combustion engine has in regard to heat efficiency will probably bring it into favor again when fuel has advanced a certain amount in cost (apparently to about $10 per ton), particularly if the installation cost can be reduced and reliability increased; but until this occurs the gas engine is not likely to be restored to favor in America.

Though the increase in the total capacity of motors operated from plant power was 1,113,576 hp., or 140 per cent, the increase in capacity of motors operated from purchased power was 727,475 hp., or 949 per cent.

Despite the use made of some by-product fuel and waste heat for power generation, a large quantity of coal is consumed. There is more than sufficient waste heat available for power alone in plants having coke ovens and blast furnaces. Coke ovens and blast furnaces operate continuously, whereas steel works and rolling mills are normally idle over the week-end, consequently about one-seventh of the waste heat from the principal sources is given off when there is no use for it by its largest consumers. This also means that even in the ideal plant there would probably be a shortage of power from waste heat during six days of the week. This condition can be met by interchanging electric power with the local public service company. The steel company would take a comparatively small average amount of power during the week, and over week-ends the public service company could shut down part of its capacity, thus in the final analysis saving the waste heat from the coke ovens and blast furnaces.

Prevailing Tendencies

From the data, estimates and general history of the art the following tendencies are deduced as showing the present, and probable future progress of power generation and application in the iron and steel industry:

1. Electrification of all power-driven apparatus except blast-furnace blowers.

2. Substitution of turbo-blowers, or possibly gas engines, for reciprocating steam-blowing engines.

3. Purchase of power requirements by plants which have no waste heat available.

4. Complete economical utilization of waste heat by means of turbo-generators for electric power generation, except where this heat can be used to better advantage for "process" or has a market value greater than its coal equivalent.

5. Interchange of electric power between plants generating power from waste heat and public service companies.

At a very successful banquet on Thursday evening the presidents of the Carnegie Steel Company and the Illinois Steel Company complimented the association on its work and dwelt on the fundamental place that electricity holds in the steel industry. A. W. Thompson and H. P. Davis also made addresses, and other speakers outlined the development of electrical applications to steel over a period of years.

Officers for the ensuing year were elected as follows: President, A. C. Cummins; first vice-president, G. H. Schaeffer; second vice-president, S. S. Wales; secretary, F. W. Cramer; business manager, John F. Kelly.

Griffith Calls the Industry to Arms

American Liberty of Initiative Threatened by Demagogic Attacks—Utilities Have Nothing to Conceal and Should Prove It to the Public—Telling Plain Truths About Public Service the Duty of the Hour

THAT the public utility industry, and hence the people that it serves so well, stand in grave peril from political attackers—a peril that should be met with straightforward truth telling about the purposes and methods of the utilities by every man and woman in their service—was the text of an impressive address made last week by President Franklin T. Griffith of the National Electric Light Association before the New England Division at Newcastle, N. H. The head of the national body aroused a storm of enthusiasm by his challenge to the forces bent on destroying the present system of private ownership of utilities under public regulation and by his call to the industry to meet demagoguery face to face and overwhelm it by simply telling the people the truth. Mr. Griffith spoke in part as follows:

"In all the divisions of the National Electric Light Association throughout the country we men of the industry are prone to confine our questions to those intimately connected with operation. We are conscious ourselves of a desire to serve, to serve well, to do the best we can by the people upon whom we are dependent. Our hands are full of engineering problems, of commercial problems, of problems which concern giving the greatest amount of service for the least possible cost to the consumer—and I say that in defiance of all the enemies of our industry, the men who assert so boldly and so falsely that the people of this industry are seeking only the welfare of their own pockets rather than the welfare of those they serve.

"No men engaged in public service anywhere have more closely at heart the welfare of the men they serve than men of the central-station service—because it is good business. The maximum of service at the minimum of cost means the maximum of return for us, and that is what we are engaged in business for. Our assailers ought to recognize that, but they don't. They assert—and many times without contradiction—that we are engaged in it for pelf and pelf only.

Threat of Public Ownership Real

"I want tonight to sound a note of warning to you men and women of this industry. I want to call your attention to that which has greeted me from one end of the country to the other, from the Atlantic to the Pacific, and particularly in that portion of the country in which I have my own being. It will come here just as sure as the sun rises and sets. Do you realize—and you will pardon me if I interject a question that might be considered political—do you realize that one of our political parties—one which, depending upon the result in November, may be called one of our great parties—has as a fundamental plank of its platform an attack on our industry? Do you realize that there is a widespread movement to make a national question and a national business of that which you have built up—that there are very many men preaching in this country, without any knowledge other than that of the casual observer, that this ought to be taken in hand as a public question, that all this distribution of energy should be public rather than private? Don't lose sight of that. Don't lose sight of our own duty to this industry. And I say that confidently, because no man of self-respect will stay in this business if he does not believe in it. If he does not believe in it, if he does not believe in the manner in which we are carrying it on, if he does not believe in private ownership as opposed to public operation, he ought to get out. And yet there has been a growing attack upon it by those who willfully undertake to strike down that which is successful.

"Be honest with yourselves, gentlemen, and, as you rise from the lower ranks to the higher positions of executive management, you will become more and more acquainted with this fact, that people do not believe that we are honest, people do not believe that we keep our accounts accurately and correctly and openly; they do believe that we have some secret hiding place in which we put our ill-gotten gains. They do not realize that public regulation has prevented anything in the way of illegal profit. That is the public psychology. Do not delude yourselves.

Fallacies from Ontario

"Do you know how this attack is being made? One of the most fruitful sources of information or misinformation used by our enemies, and I say that advisedly, is the experiment in Ontario. You have all heard about the Ontario Hydro-Electric Power Commission. I believe that, especially in talking to the members of our own great family, I ought to call a spade a spade, and I ought not to mince my words and leave anything to misunderstanding. Ontario is held up all over this country, and especially in those districts where there is potential water power, as a solution of all the problems of public service. There, it is contended, we have public service carried to its ultimate conclusion in service to the 'dear people.' And yet compare the operations of the Ontario Hydro-Electric Power Commission with those of privately operated companies in the United States, and I will prove to you that while the domestic rates of the Ontario commission are cheaper than most of the domestic rates on this side of the line, its power rates are 20 per cent higher than ours.

"In other words, the Ontario Hydro-Electric Power Commission is doing just what every municipally owned plant of the United States has done until it went into the hands of the private operator; it is currying favor with the voter, and it is making the power user, the wholesale user, pay for the service to the small consumer, because the small consumer has the votes. We do not seem to know that, and yet that argument is being used all over this country: 'Do what they are doing over there. Issue bonds. We can get money for 2 or 3 per cent less than any public utility in the United

States, because we have all the taxing power of the community behind us. We can serve better. We don't have taxes to pay. After we have got our money, our interest charges are less.' And then they urge that that should be the solution of the problem. The practical result is that, even with the advantage of the low interest cost and no taxes, they are not serving on a basis of favorable comparison with the majority of the hydro-electric plants operating on this side of the line.

"Do you know that when Senator La Follette promulgated his platform, there was in it this plank: 'We believe in the complete development of all hydro-electric current in this country by the national government. We believe in trunk systems operated by the government, financed by the government, and selling to municipalities throughout the nation.' I do not know that they could say in more plain English than that: 'We believe in the absolute destruction of private operation of electric utilities in the United States.' This is the program upon which Mr. La Follette is making his campaign. It is not urged so much in New England, but it is urged most strenuously in that portion of the country west of the Mississippi River. If it carries out there, it is bound to react upon you gentlemen. Don't think for a moment that here, where this nation found its first being, you are going to be separated from the rest of the country, that you are going to be permitted to continue in your own quiet fashion developing without reference to the rest of the country. We are all one. What affects one part of the country must inevitably affect all, and if the plan of destruction is successful in other parts of the country, it is absolutely certain that it will be tried here.

PUBLIC RELATIONS PARAMOUNT

"The greater problems of the industry are the questions of public relations, the importance of acquainting the public with what is supposed to be mysterious. There is no mystery about public service. We don't seem to make the people whom we serve, and whom I say in all honesty we delight to serve, know the facts. Our job should be just as much to acquaint the people we are serving with the absolute, concrete facts of public service as it should be to give better and better service by the advance of all our public utilities. Lose no opportunity, I pray you, to disseminate information truthfully—never anything but truthful information—about the inwardness of public service. Try to acquaint the people of the whole country with the fact that in this day of complete regulation there is no opportunity for false profits.

"I have had it said to me, and by men who presumed to be friends of mine—it is all right—during rate conferences before our public service commissions: 'You do present statements and books of account showing you have only so much revenue out of the business you are conducting. But you are too clever for that. You are making more money than that. You have another set of accounts in which you keep the true facts.' Men will say things to a public service man—I hope they don't do it in New England, they do it in the West—that they wouldn't say to the representatives of any other class of business. Why, we are said to be super-clever men in deceiving the public.

"The story is such a simple one, if we can only make it clear to the public that we cannot be dishonest even if we want to be, and that we cannot possibly keep more than one set of accounts. Take any major territory; you will know that there are anywhere from fifty to five hundred people in the accounting department, every one of whom would know if you were deliberately evading the law, and that knowledge must become public property. It is impossible to deceive everybody; it is impossible to keep more than one set of accounts, or any set of accounts except one which is absolutely accurate.

TELL HOME TRUTHS TO HOME PEOPLE

"How often does it happen that men in your own offices, if you found out about it, are asked questions almost daily, and they don't know the answer any more than the man in the street. And they don't know the answer because we haven't told them what the truth is, what the answer is. They are in their little rut and they don't get out of it unless they are pushed out of it. Push them out of it! Give them the facts. Let them be the disseminators of the facts. Get your public relations based on the theory that men engaged in this business, just as much as men engaged in any other business, are fundamentally honest; that, indeed, they are more honest, because there is a greater punishment visited upon them for dishonesty than is visited upon men engaged in any other industry.

CLASS APPEALS MUST BE OPPOSED

"These appeals to the general public, to the voter, to change the existing system, to do that which is presumably for the benefit of the greatest number, to create a governmental agency that will not only rule, govern and protect, but will also support, are appeals to four classes of people. There is one class, unfortunately a large class, of men and women, in this day of equal rights, who have been unsuccessful through no particular fault of their own—men of real native ability who have failed to progress, to advance, and they feel a very natural resentment against those who have succeeded. That is the dissatisfied class. Then there is the willfully ignorant class, the people who will not acquaint themselves with the truth, and the incompetent and the slothful classes. When you get those four classes of people together you are going to find 95 per cent of the doctrines preached by the men who are trying to disrupt that which has been created through centuries of intelligent direction by the business men of today. Those are the elements being appealed to today by the radicals in our government, who would destroy that which we have created.

INDIVIDUALISM THE BASIS OF LIBERTY

"I feel sometimes when I talk about this subject that we are losing sight of the fact that the government of the United States was founded upon the right of the individual to develop. Individualism—its protection, its growth and its expansion—is the cornerstone of American liberty. There is no possibility of government doing more for the individual than the individual can do for himself. I believe, and I dare say that most of you gentlemen before me—if I do not say 100 per cent of you—believe, that this government is founded upon the principle that every man should have the right to perform his task, and that to every man in proportion to the efforts he puts into his task should come the full reward for that task. Individualism is the basis of American government. Let us support it. Let us believe that we ought, as men of this industry, to support the principle that every man

has the right to succeed and that his success should depend upon the amount of effort which he can bring to the task to which he is assigned. There is no panacea for taking care of individuals by the government, because in the last analysis government is made up of individuals. We can have no prosperity in government unless the individual prospers. If the individual is subordinated to the government, then the government of the United States must necessarily fail. It is our job, as much as that of any other class of men on this earth, to prevent that from occurring."

Electrification of Germany

Great Progress Is Being Made in the Extension of Systems Dependent on Lignite and Water-Power Central Stations

GERMANY'S electrification is proceeding rapidly. This is a reply to the Versailles treaty's separation of the Saar coal area and to the much more seriously felt cession of East Upper Silesia to Poland, through which measures coal fields containing an estimated 189,000,000,000 tons out of a total estimated 424,000,000,000 tons were lost to the German Republic. The power bases of the new electrification are not coal, but lignite and water power. This month the vast Inn water-power station in south Germany will be opened, which, in addition to making possible the production of an unstated quantity of carbide by the Caro process, will increase the republic's aluminum-producing capacity by 10,000 metric tons a year to a total of 38,200 tons, as against only 800 tons output, all by a single aluminum company, before the war.

Aluminum Replaces Copper

As efforts are being made in Germany without cessation to replace copper by aluminum in electrical domains, this development has a double interest for the United States. The new Inn power station is only a small item in the vast electrification plans now partly realized, partly under way. The primary objects are: (1) to develop south German water power; (2) to replace coal generation almost entirely with lignite generation; (3) to link the mineral fuel stations with the water-power stations by high-voltage transmission in order to effect a more economical distribution and to equalize seasonal differences in consumption.

The chief present water-power stations are in Bavaria, Württemberg and Baden. But water power is used to a small extent in the great Westphalian, Hanoverian, Hessian and Pomeranian central stations, where only coal was used before the war. In 1913 the Westphalian and Brandenburg power stations were exclusively fed with coal, and the only important station which used lignite exclusively was that of central Germany. All these stations have enormously increased their capacity by using lignite. Of the added capacity of the Westphalian central station, nearly half has been achieved by use of lignite; of the added capacity of the Brandenburg station more than one-half, while the central German interconnected stations, which are also increased in capacity, still use only lignite and three-quarters of the power in the Saxon central station comes from lignite.

At the beginning of 1914 Germany possessed 1,600 public electric power stations with capacity of 1,500,000 kw. All these stations lay in the center of their supply areas. Increasing the transmission voltage widened the area of supply, but did not lead to interconnection. This, in connection with the increased capacity of the stations, is being altered. The present total capacity, double that before the war, is about 3,000,000 kw., and the developed energy in kilowatt-hours has about trebled. Before the war 68 per cent of all power generated was with coal and 23 per cent with lignite. Today coal supplies 48 per cent and lignite 41 per cent. Before the war practically the whole Rhenish-Westphalian electrical supply was produced with coal; today, counting minor stations, 40 per cent is produced from Cologne lignite, though these lignite mines are situated on the edge of the supplied area. To-day Brandenburg, including Berlin, draws nearly half its light and power by high-voltage transmission from lignite stations in neighboring provinces. In all Germany water power supplies 9 per cent of the total electrical energy, but this percentage will increase in the coming years in connection with important river-regulation projects which are part of larger plans for ship canals.

The use of cheap lignite for generation on the spot, replacing dear coal with its heavy freight burden, is an outcome of increased transmission voltage. For direct firing German lignite will not bear carriage for more than about 100 km.

Water-Power Situation Outlined

The water-power question is not quite the same. In the Bavarian Alps, which generate most electricity, the power supplied in winter is only half that of summer, although the demand for electricity for lighting is greater in winter. Union with the great coal and lignite stations farther to the north is therefore necessary. As a result plans are under way and are partly realized to unite the Bavarian, Thuringian, Harz and other water-power stations with the great steam-power stations of west and central Germany; Director Jahnke promised 200,000-volt transmission. Meantime Bavaria's water power and the central German lignite area are being united by 100,000-volt transmission between Herlasgruen, in Vogtland, on the southern fringe of the lignite district, and Hof, in Bavaria. Under construction also is the connection of the Bavarian and Württemberg centrals and of the Württemberg and Baden stations. In west Germany a similar connection is planned. This, however, waits for the completion of water-regulation plans in the Upper Rhine valley. If it proves possible to finance the projected great Harz Mountain water-power station, which requires the damming of a valley, Westphalia and central Germany will be united by a 200,000-volt network. The completion of this work would mean the electrification of the whole republic with the exception of the extreme north and northeast.

Kilowatts and Horsepower

In a review of the world's natural power resources as given in reports at the recent World Power Conference the ELECTRICAL WORLD on September 13 (page 511) quoted 25,975,000 hp. as the estimated potential water powers of the United States available 90 per cent of the time and 41,052,000 hp. as available 50 per cent of the time. The figures quoted were for kilowatts, not horsepower, as inadvertently printed.

Letters from Our Readers

Saturation Point in the Industrial Power Field

To the Editors of the ELECTRICAL WORLD:

A letter from W. M. Carpenter of the Empire State Gas and Electric Association, New York, in your issue of August 30, questions whether central-station output will reach the "saturation point." The letter considers particularly the Northeastern superpower report recently issued. The idea of saturation is not new. The first time where it was brought up in this country in connection with superpower development, to the writer's knowledge, was in connection with the report by W. S. Murray and others on "A Superpower System for the Region Between Boston and Washington," prepared in 1920 and 1921. The industrial load considered in that report was definitely based on the saturation theory. This is very plainly shown by Fig. 17 on page 145 of that report.

I draw particular attention to this point since many have been slow to believe that there is such a thing as a saturation point for central-station energy in the industrial power field. The recent depression has, however, unfortunately proved it to some companies that had absorbed virtually all of the industrial power in their territories and become industrial power houses. These companies have felt the recent depression to a greater degree than has been usual in the central-station industry.

This, however, does not absolutely prove that there is a saturation point for all uses of central-station power. It shows that the old sources for new load can be saturated, but what can be done by the companies which can appreciate this and go on to the development of new loads time only can tell. H. GOODWIN, JR.

Sanderson & Porter,
New York.

Colonel Kelly Throws Further Light on Northeast Superpower Report

To the Editors of the ELECTRICAL WORLD:

With reference to the letter of W. M. Carpenter, Empire State Gas and Electric Association, published in the ELECTRICAL WORLD of August 30, 1924, commenting on the report of the Northeast Superpower Committee, under the heading "Will Central-Station Output Reach 'Saturation Point' in the Next Decade?" the following may be helpful:

In the report referred to by Mr. Carpenter every effort was made to achieve brevity and to avoid technical expressions confusing to any one but a technical man. No doubt in this effort there has been omitted considerable explanatory matter that would give the report a greater value to engineers. To overcome this the Federal Power Commission will cheerfully furnish explanations of the assumptions used and the results published to any one applying therefor.

The "appalling contradiction" found by Mr. Carpenter is due to his confusion of "power produced" with "consumptive demand." Power produced in 1922 was 21,100,000,000 kw.-hr. The consumptive demand for 1930 is estimated at 30,800,000,000 kw.-hr., whereas the prediction (see Plate IV) as to power produced in 1930 is 40,000,000,000 kw.-hr. The ratio of consumption to production is about 73 per cent; that is, 27 per cent of the power produced is lost in transmission, distribution, etc. Discussion of importation of power from Canada was not omitted because it was considered unimportant, but because it was believed that as far as such power becomes available on terms that can compete with power produced in the United States it will be used and to the extent used will take the place of new installations in the United States. W. KELLY,

Chief Engineer Federal Power Commission.
Washington, D. C.

Why Engineers Are Underpaid

To the Editors of the ELECTRICAL WORLD:

The recent communications of Messrs. Foster and Marsteller on the above subject are exceedingly interesting. While there are, without doubt, a variety of reasons to account for the relatively poor pay of the average engineer, may not one of the reasons be that the average engineer is not a good salesman? In order to receive an attractive remuneration, an engineer should be a good salesman. He has but one product to sell—his services.

Good sales ability is essential in obtaining a high price for a competitive article of utility in that the reasonableness of the high price must be clearly and convincingly set forth to the prospective customer. A most excellent article may be an entire commercial failure if its merits are not irresistibly presented, and many an inferior article has received wide use through superior selling effort. A high price almost invariably necessitates sales ability of a high order; any one can make a sale if the article is satisfactory and the price is low enough.

In selling a commercial product for a high price its value and superiority must be presented in a truth-convincing manner. In selling an engineer's service for a high price his skill and ability must be presented in the same manner.

It is unfortunate, however, that those characteristics desirable in an able engineer are, in the main, opposed to those desirable in an able salesman. An engineer usually is, and even should be, a pessimist; the salesman an optimist. The engineer, both by nature and training, is constantly striving to improve his product. He is compelled, therefore, carefully to observe the defects in his apparatus; the good features do not need close study. The defects, however, are so magnified in his fertile imagination as often to overbalance the good points, and the apparatus, in his biased opinion, then becomes of doubtful value.

The engineer is led by his temperament to take the same view of his own ability. When he is trying to sell his services he knows his weak points, and these, in his mind, so completely overbalance his many excellent and possibly unrealized qualities that he cannot present his case in a convincing manner; his personal defects overshadow his good points, in his mind. The salesman, on the other hand, must of necessity be constantly on the lookout for good qualities in his product; the defects are submerged. It should be so with the engineer. An able engineer's good points obviously more than overbalance his weak points, and he should train himself to assign to all points their proper values, whereby to condition himself to present his wares in a convincing manner and consequently dispose of his personal services at a satisfactory price.

Boston, Mass. T. T. GREENWOOD.

Central Station and Industrial Practice

Electrical Brass-Smelting Experience

ELECTRICAL brass-smelting furnaces can be operated at an approximate expense of two-thirds the cost of pit-fire operation, according to H. M. St. John, chief metallurgist Detroit Lubricator Company, who is melting 20,000 lb. of electric red brass daily. With a total daily production of 50,000 lb. from the foundry, the above comparison was obtained over an operating period of three years. The red-brass alloys melted vary in copper from 80 per cent to 85 per cent; tin, 2 to 5 per cent; zinc, 5 to 8 per cent, and lead 5 to 10 per cent. The brass melted is poured directly from the furnace into a crucible from which the metal is again poured into molds manufacturing the company's products, varying from carburetors, valves and fittings to lubricators.

The electrical equipment consists of one 300-kw. single-phase Detroit arc furnace which yields six heats each weighing 2,000 lb. per nine-hour day and two 60-kw. Detroit arc furnaces averaging sixteen pours a day with a weight of 220 lb. All pouring from the furnaces is done at a temperature of 2,300 deg. F. Energy consumption averages around 300 kw.-hr. per ton. The electrode consumption was kept down to 4½ lb. per ton by the exercise of care in not allowing air to enter through the electrode portholes, thus avoiding breathing and abnormal heating of electrodes. The transformer capacity of 300 kw. is supplied from a 4,600-volt circuit transferring energy down to 110 volts. This then feeds the furnace 3,500 amp. To facilitate operation kilowatt-hour meters are mounted near the furnaces so that the operators can check the energy input with the average necessary time for melting. The maximum demand for the 300-kw. Detroit furnace is about 275 kw.

From the operation standpoint with electric furnaces, the human element is not so prominent as in pit-fire operation. However, first-class mechanics are needed to operate electric furnaces because of the improved control. With this control the possibilities of obtaining a better quality of brass over long periods of time are increased. Besides the saving in the operation there is a further saving in labor because of the larger furnace charges melted. A neutral atmosphere is necessary to avoid oxidization and reduction of metal. Operating results are greatly superior to those achieved with the old pit-fire methods.

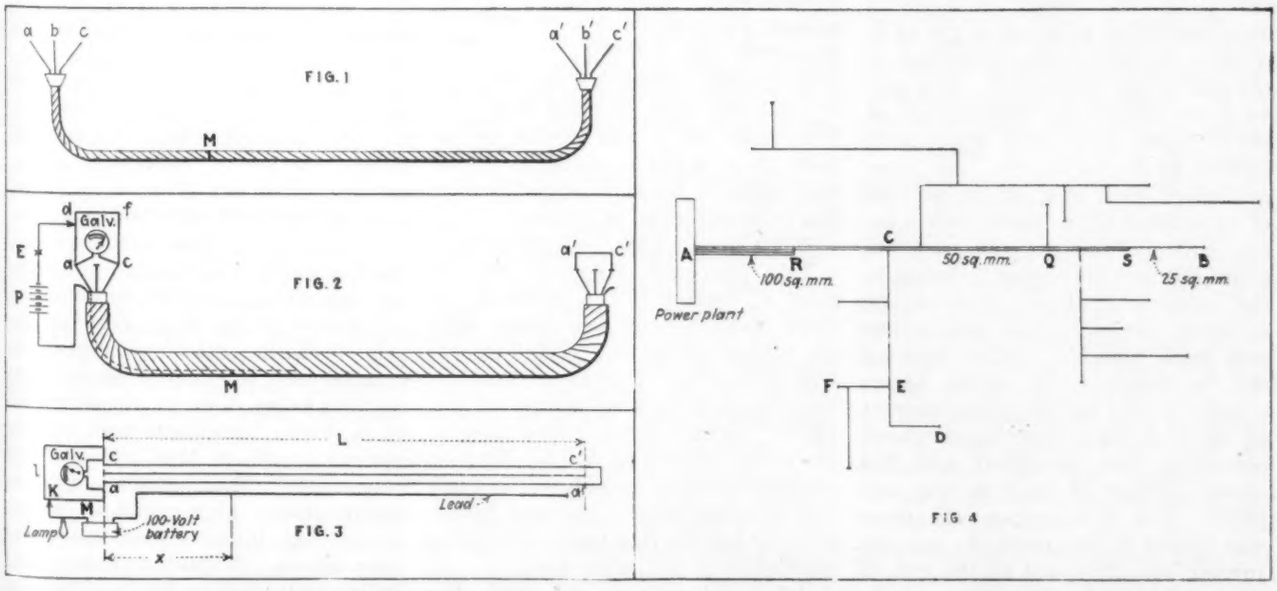
Locating Faults in Underground Cables

Application of Wheatstone Bridge Arrangement to Complex Networks —Description of Apparatus Required and General Layout— Usefulness of Method Shown by Practical Examples

BY VICTOR TRUANT
Paris, France

A METHOD for locating faults in buried cables consisting principally of an application of the Wheatsone bridge arrangement shown in the accompanying illustration has been employed with success in France. No excavating is necessary and the entire proceeding is very simple.

An underground cable is shown in Fig. 1 with *a*, *b* and *c* representing the conductors at one end. Assume that a ground occurs between one conductor and the lead covering at the point *M*. Then apply the Wheatstone-bridge principle as shown in Fig. 2. From *a* to *c* a ferro-nickel wire, 2 m. long and 1 mm. in diameter, is attached as shown at *a*, *d*, *f* and *c*. A sensitive suspension-type



WHEATSTONE BRIDGE APPLICATION FOR CABLE FAULT FINDING ON LARGE NETWORKS

galvanometer is then placed across the points a and c and a 100-volt battery p is connected between the lead sheath of the cable and a sliding contact between a and d. The points a' and c' are jointed with a heavy cable jumper. A lamp (E) is placed in the circuit of the battery which forms the limiting resistance and indicates at the same time during the test whether the fault at M persists or not.

When the connections are completed, as shown in Fig. 3, the test is conducted as follows:

The sliding contact K is moved until the galvanometer indicates either zero or the same positive and negative deflection. If

n = the distance from the slider to the a end of the damaged conductor,

l = the total length of the slide or bridge wire,

L = the single length of the cable, and

x = the distance of the fault from the tester,

the equation may be written:

$$n/(l-n) = x/(2L-x),$$

which solves for x as follows:

$$x = 2L\ n/l.$$

If l be made just 2, and n be expressed in meters, the last equation may be simplified to:

$$x = Ln.$$

An actual example of such a localization of a fault may best illustrate the method. Fig. 4 shows the network which feeds most of the customers of a large French city. From the power station A extends a cable of 100 sq.mm. cross-section as far as the point R. From here on a 50-sq.mm. cable proceeds as far as S. A 25-sq.mm. cable leads from here to the end of the trunk at B. The network distributes electrical energy at about 15,000 volts with substations located at B, D, F, etc. All these customers were shut off on account of an accident to the cable, which, being entirely underground, did not allow a direct inspection. Owing to the complexity of the network, no selection by successive separations was made possible. After burning out the defect by a special device supplying high voltage direct current of up to 60,000 volts, the damaged conductor was grounded and the above method of location was applied. The Wheatstone apparatus was placed at the point A, and the jumper was arranged at the end of the trunk at B to get a general indication of the fault location.

The length found for n was 84 cm. on a bridge wire 2.36 m. long.

It is obvious that this bridge method will give useful results only for absolutely uniform conductors. The dimension L must therefore mean either the length of a cable of same cross-section, or, if there are various cross-sections in the trunk, they must be reduced to one size. In the case assumed the following lengths of cable and corresponding sections obtain:

From A to R, 78.90 m. of 100-sq.mm.
From R to S, 853.10 m. of 50-sq.mm.
From S to B, 76.00 m. of 25-sq.mm.

These various sizes of cables can be readily reduced to one size, for example, all of 100 sq.mm., giving a fictitious total length. A certain length of 50-sq.mm. cable is equivalent to twice the length of a 100-sq.mm. cable; one of 25 sq.mm. is equal to four times that length of a 100-sq.mm. cable. In this way the example shows:

$$L = 78.90 + (853.10 \times 2) + (76 \times 4) = 2{,}089.10.$$

From this:

$$x = 2{,}089.10 \times 2 \times 84/236 = 1{,}487.60 \text{ m.}$$

This is a fictitious value and it must be reduced back to actual conditions, thus:

$$x = (1{,}487.60 - 78.90)/2 + 78.90 = 783.20 \text{ m.}$$

From Fig. 4 it is apparent that the distance found corresponds to the point C and that the fault must therefore be located somewhere on the branch supplying the stations E, F and D. To find it the jumper was removed from point B and was placed instead at the point D. New measurements were made with the following results:

$n = 85.30$ cm. $l = 2$ m.

$$L = ACDE = 78.90 + (704.10 \times 2) + (543 \times 4) = 3{,}659.10 \text{ m.}$$

The value of x was found to be $3{,}659.10 \times 0.853 = 3{,}120$ m. This was again a fictitious value, which had to be corrected as follows:

$$(3{,}659.10 - 3{,}120)/4 = 134.70 \text{ m.}$$

This narrowed the fault to the point E, located 135 m. from D. A third measurement was made, with the jumper placed at F. This gave n 1 m. with l 2 m. This meant that the fault must be located exactly at the end F. In fact, it was found to be in the cable pothead at F. No further calculations were necessary; the fault was definitely determined and found, without having to suspect any other substation or the cable itself.

After determining the fault, the high-tension testing device was again connected to the cable in the powerhouse A, and an observer watched the faulty pothead. At 30,000 volts the characteristic noise was heard by this observer in the pothead. After its opening it was found that one of the insulating sleeves around one of the phases of the three-phase cable was broken, causing a breakdown between conductor and ground.

Compact Cabinet Holds 8,760 Charts

AN UNUSUALLY compact cabinet for holding recording instrument charts was built not long since at the plant of the Dennison Manufacturing Company, Framingham, Mass. With over-all dimensions of only 18½ in. x 31¾ in. x 60½ in., the cabinet contains twelve drawers in two tiers of six each and has a storage capacity of two years' supply of daily charts. To meet a "jog" in the wall against which the cabinet stands, one set of drawers is 12 in. and the other set 17 in. long. The drawers are built with bottoms ¾ in. thick and 13⅜ in. wide, without sides, and the ends, which are 8⅜ in. high, are braced against the bottoms by end pieces 3¾ in. long. The charts are filed in calendar order on spindles near the drawer centers, the spindles being ⅛ in. in diameter and 8⅜ in. high. The charts used include records made on the following instruments: Watchman's system, thermograph, high-pressure steam, power load, lighting load, low pressure steam, steam-flow meter and Bailey boiler meters for four boilers, with one spare drawer.

INSTRUMENT CHARTS AVAILABLE MONTHS AFTER RECORDS ARE MADE

Filtering Transil Oil

IN THE instructions formulated by the Worcester (Mass.) Electric Light Company covering the inspection, repair and testing of transformers the service engineer is responsible for the proper filtering of all transil oil used in this equipment. According to these instructions, when transil oil requires filtering because of the presence of moisture, dirt or other foreign matter, the transformer repair man shall proceed as follows:

If the work is to be done at some other place than the transformer room, he shall set up the electric oven used for drying filter paper, fill it with filter paper and leave with at least three notches of heat turned on for not less than three hours before using the paper. In the meantime he shall set up the transil oil tank and filter pump in some dry location which is convenient to the apparatus containing the oil to be filtered. When the filter paper is thoroughly dry, four sheets shall be placed in each section of the filter. The pump shall be started, forcing the oil from the apparatus through the filter and into the transil-oil tank. When the pump starts to labor excessively, it indicates that the filter is clogged, hence the pump must be stopped and the filter paper renewed. This may occur after 15 gal. of very dirty oil has been passed, or if the oil is in good condition, 150 gal. may be filtered with one set of papers.

No attempt shall be made to filter oil out of doors except in dry, settled weather, and not then if shelter is available.

Motor-Driven Circulating Pumps

Characteristics of Circulating System, Applications of Various Pump Combinations, Desirable Speed Requirements and Economical Operation Discussed

BY H. B. SEELEY
General Engineer Westinghouse Electric & Manufacturing Company

IN ANY large generating plant the power required to drive the auxiliaries is a relatively large item. It is necessary, therefore, in the design of large generating stations to select auxiliary equipment which will give the best possible operating economy as well as the desired high degree of reliability. As one of the largest power-consuming auxiliaries, the circulating pumps demand particular consideration. A study of this application is profitable because the water rate of the main unit is affected directly by the method of circulating-pump operation. However, it is impossible to draw any definite conclusions as to the best system to apply, since it is recognized that there are so many variable factors that no one system can give the best results under all conditions.

FLOW OF WATER

In most circulating systems the intake and discharge are at the same level. With both intake and discharge submerged and no air leaks in the piping, siphonic action takes place so that the only head the pump has to work against is the frictional head in the condenser and piping. The friction head varies with the volume of water circulated. This relation between head and discharge is approximately a square relation so that doubling the gallons per minute will increase the head to about four times. Assuming no change in pump efficiency, the power required to circulate water through the condenser will vary with the cube of the gallons per minute.

When driven at constant speed, a centrifugal pump has its maximum efficiency at a definite head and discharge. If the head is reduced, the discharge increases, but the efficiency is lower; if the head is increased, the discharge decreases and the efficiency is again lowered. With a change in speed both head and discharge are varied. The discharge varies directly with the speed and the head as the square of the speed. Thus, if the speed is decreased one half, the point for best efficiency will be at one-quarter of the original head and one-half of the original discharge.

A variable-speed circulating pump will give excellent results. Thus, if the pump is selected to operate at best efficiency for one speed, it will be at best efficiency for any other speed, since with an increase in speed both the head required by the circulating system and the developed head of the pump change as the square while the discharge changes directly as the speed. The pump efficiency will change only a small amount. The objection to a variable-speed system is high cost due to complicated control system and, if wound-rotor induction motors are used, the motor efficiency is reduced at the lower speeds because of the loss in the secondary resistors. However, since the power required by the pump varies as the cube of the speed, the power taken from the line will drop rapidly with reduced speed in spite of the lower motor efficiency and the energy saving as compared with a constant-speed unit may be material. When a single variable-speed pump is used for each condenser, it is advisable to use a dual drive with a turbine on the same shaft to pick up the load in case of motor trouble or failure of power.

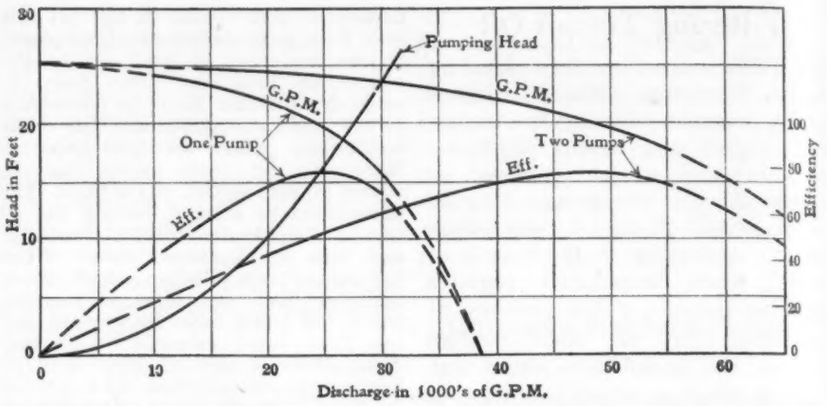
USE OF TWO-SPEED MOTOR

Under some circumstances a single pump unit driven by a two-speed motor may give results equal to the variable-speed unit. This unit also should be dual-driven to afford reliability. A squirrel-cage induction motor can be wound with two separate stator windings to give two different speeds, and the efficiency when operating on either winding is high. As in the previous case, the pump will operate at its best efficiency for either speed. The saving in first cost due to simplified control and the high operating efficiency may make this system more desirable than the variable-speed unit, despite the fact that the variable-speed unit can be slowed down to give the correct amount of water with reduced power input.

When two identical constant-speed, motor-driven units are used, the question of pump efficiency should be investigated. If each pump is capable of supplying the maximum water desired when operating alone and the other pump is used merely as a standby, the pumps, of course, should be chosen to run at best efficiency when operating alone. If, on the other hand, they are to operate in parallel to give this maximum discharge and one alone is to be used when the cooling water is at a low temperature, the question arises as to whether they should give best efficiency in parellel or when operating alone. If they operate at best efficiency when in parallel, then when one operates alone the total flow will be something over half of the original and at lower head. As explained before, the efficiency will be reduced. On the other hand, if the pumps give best efficiency when operated alone, then when they are paralleled the discharge and head are increased and the efficiency reduced. The choice will depend upon whether the system is to operate for a greater

part of the time at the high discharge or whether the pumps are to be paralleled for only a short time during the year. The system should be chosen to give the best average efficiency. In general, it is best to have the high efficiency in parallel because the losses of two machines are to be considered, whereas when one alone is used the losses of only one machine have to be carried.

Another combination that has been considered is two constant-speed, motor-driven units of different size, the larger unit to be used for the high discharge and the smaller unit when a low discharge is sufficient. In this case both units operate at best efficiency alone. In general, it would be impracticable to design these pumps for parallel operation, since the small pump normally operates at a considerably lower head than the large one. The smaller unit would be chosen to give about half the discharge of the large unit and would, therefore, work against a head of about one-quarter that of the large pump. The small unit would be much smaller than the large one because the size and horsepower requirement drops off with the third power of the discharge. Thus, if the small pump is designed for one-half the discharge of the large pump, it will be much smaller and a motor of only about one-eighth the horsepower rating of the large pump motor will be necessary. This arrangement would be undesirable from the standpoint of spare parts. Furthermore, the total installed pump capacity would be greater than in the previous cases by the amount of the small pump capacity. In order to justify its use, therefore, the additional saving afforded by high operating efficiency must be great enough to pay for the added investment in equipment and spare parts.



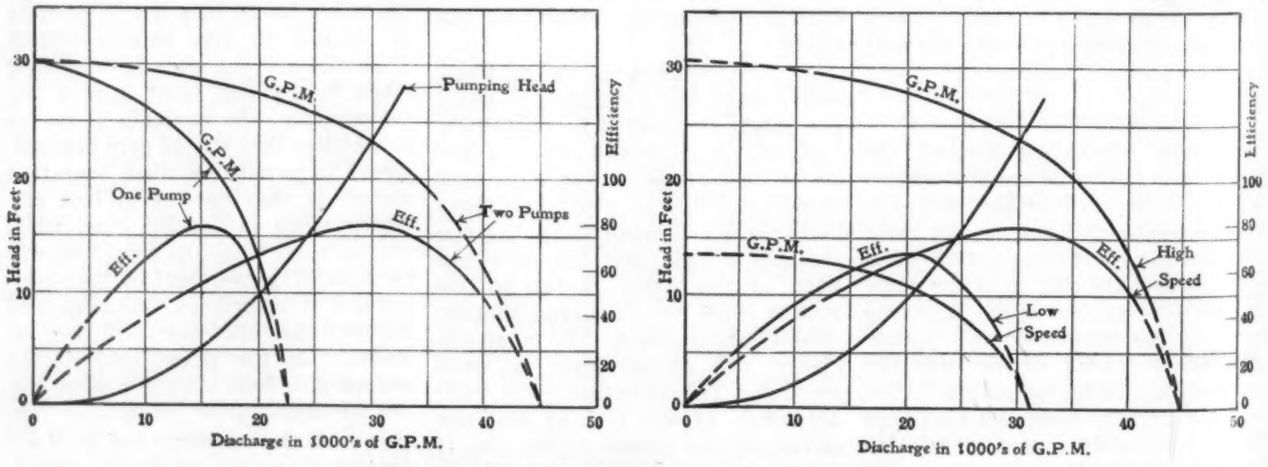
TWO CONSTANT-SPEED PUMPS GIVING BEST EFFICIENCY WITH ONE PUMP IN OPERATION

Many other schemes are possible, such as one variable-speed and one constant-speed unit of either the same or unequal capacity, or one two-speed and one constant-speed unit giving three efficient operating points.

For each generator load and every cooling water temperature there is a certain most economical circulating-water discharge. In general, no attempt is made to vary the pump speed with the load on the main unit. However, a large saving is effected by changing the pump speed with the seasonal variation of cooling-water temperature. When variable-speed pump units are used, the speed may be varied gradually over the entire range. This allows the speed to be adjusted to each change in cooling-water temperature. When a system giving two constant speeds is used, the change from one speed to the other is made at one definite value of circulating-water temperature.

With a variable-speed system the power required to drive the pump goes up as the cube of the speed. Even with a wound-rotor induction motor where the motor efficiency is low at the lower speeds, the power input to the motor varies approximately with the square of the speed. It is apparent, then, that at high speed the amount of additional power necessary to increase the discharge a given number of gallons per minute is greater than would be required to produce the same increment at lower speed. In this particular case of a wound-rotor induction-motor drive it will take twice as much increase in power input to increase the discharge from 40,000 gal. per minute to 41,000 gal. per minute as it takes to increase it from 20,000 gal. per minute to 21,000 gal. per minute. With a variable-speed installation, then, the energy cost of an additional gallon per minute has a definite value for each discharge, and this value increases with increase in discharge.

Consider the conditions in the turbine and condenser. At a constant value of load and cooling-water temperature, the water rate of the turbine is decreased with an increase in



OPERATING CHARACTERISTICS OF CIRCULATING PUMPS

Left—Two constant-speed pumps giving best efficiency, with both pumps in operation. Right—One variable-speed pump operating at best efficiency.

circulating water. This effects a saving in steam. At a low circulating-water discharge through the condenser the amount of steam saving for each additional gallon per minute is large, but as the discharge is increased the vacuum is improved to the point where additional circulating water has very little effect on the water rate. Under conditions of constant load and constant cooling-water temperature, the amount of steam saved for an added gallon per minute of circulating water will be a definite amount for each value of discharge, and this amount will decrease as the discharge is increased. It is evident, then, that, with a variable-speed unit, as the speed is increased the cost of each additional gallon per minute increases and the value of the steam saving for each added gallon per minute decreases. For most economical operation, therefore, the motor speed should be increased so long as the cost per hour of each additional gallon per minute is less than the value of steam saved by that added gallon per minute. The best operating point will thus be at the place where these two quantities are equal.

CONSTANT-DISCHARGE PUMPS

The operation of a system giving two definite constant discharges differs materially from the variable-speed operation. When the system is operated at the high discharge more power is required than for operation at the low discharge. In order to justify operation at the high discharge the value of the additional steam saving must be greater than the difference in cost of energy. The system would be operated at the low discharge when the cooling water is at a low temperature and the steam saved by operation at the high speed does not pay for the additional power used to drive the pumps at the high discharge. It will thus be seen that the larger the difference in power requirements between the high and low discharge, the higher will be the cooling-water temperature for the point of economical transfer from low to high discharge.

Extra Bearings for Direct-Connected Exciters

SOME companies using moderate-size turbo-generators with direct-connected exciters have reported trouble for improper commutation and excessive maintenance due to vibration of the unit. In the cases where these troubles have been experienced the exciters have no bearings of their own, the armature being mounted on the overhanging turbine shaft. The trouble has been attributed to the eccentric rotation of the end of the shaft carrying the exciter armature. To eliminate it at least one company in the Southwest has reported that it will require that all direct-connected exciters which are purchased in the future be provided with separate bearings. The exciter shaft will be connected with the turbine shaft by a flexible coupling.

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Transformer Installation Requirements

Transformers.—The following transformer sizes shall be standard: 1.5, 3, 5, 7.5, 10, 15, 25, 37.5, 50, 75, 100 and 200 kva., except that: (a) No transformers smaller than 3 kva. shall be used in the 6,900-volt to 230-volt class; (b) no transformer smaller than 10 kva. shall be used in the 2,300-volt to 460-volt class, and (c) no transformer smaller than 25 kva. shall be used in the 6,900-volt to 2,300-volt class.

Transformer Capacity. — Before installing a new transformer the existing distribution should be carefully looked over to determine the possibility of changing the location of an old transformer to secure the same result. The transformer capacity required to supply any given load may be estimated as follows:

(a) Residential loads may be estimated at an average demand of 150 watts per house. This average value may reach 200 watts or higher in the best residential districts and will be about 75 watts in the mining districts.

(b) Commercial lighting requires transformer capacity equal to 40 per cent to 60 per cent of the total connected load.

(c) Heating and cooking loads based on ranges with 3,000 watts connected load require a transformer capacity as shown in Table XIX. In general, ranges should not be considered in selecting the size of the transformer. The requisite transformer for supplying the lighting will usually provide sufficient capacity for the ranges. However, no range should be put on a transformer of less capacity than the range, and no range should be connected to secondaries at a greater distance than three spans from a transformer.

(d) The transformer capacity required to supply motor loads shall be found from the motor ratings. Find the total connected motor load and the number of motors. Then, from Table XX, get the proper percentage for the load and number of motors. Multiply the load in horsepower by this percentage to get the transformer capacity required in kilovolt-amperes. Select the next larger standard size of transformer to this required capacity. All motors greater than two in number and less than 1 hp. each in rating shall be taken collectively and their aggregate capacity, when not in excess of 5 hp., shall be taken as one motor. For greater than this amount the multiple of five shall be taken as the number of equivalent motors. In case the load is to be supplied by two transformers connected in open delta, the capacity required as found above shall be multiplied by 1.35 before selecting the size of the transformer required.

TABLE XIX—TRANSFORMER CAPACITY REQUIRED FOR RANGE LOADS

Number of Ranges	Minimum Size of Transformers, Kva.
1	3
2 to 4	5
5 to 7	7.5
8 to 11	10

TABLE XX—TRANSFORMER CAPACITY REQUIRED FOR MOTOR LOADS

Total Connected Load, Hp.	Percentages for calculating Kva. Demand from the Normal Rated Capacity of Motors					
Number of Motors	1	2	3 to 5	6 to 10	11 to 20	21 or More
Less than 9.9	83	81	75	73	..	.....
10 to 49.9	78	76	70	68	67	65
50 to 99.9	74	72	65	62	61	60
100 to 299.9	72	70	61	59	58	57
Over 300	70	69	58	56	55	54

Use of Copper-Clad Ground Chains Favored

BY C. B. HEFNER
Superintendent of Distribution Dallas (Tex.) Power & Light Company

TO SAFEGUARD linemen while they are working on transmission circuits the Dallas Power & Light Company has adopted the use of copper-clad ground chains which are thrown over the line on each side of the point where linemen are working and grounded to water pipes, anchors or pipes driven in the ground. No. 31 Oneida copper-clad steel chain, weighing 126¼ lb. per 1,000 ft., is used for this purpose. Where a driven ground is employed, 1-in. pipe is driven from 8 ft. to 10 ft. into the ground. This safeguard has been found very effective, the accidental energizing of a line never having fused the grounding chain, which carries sufficient current to open the breakers.

Central Station Business

Electric Service Explained to School Children

FOR the past four years the Illinois Committee on Public Utility Information has been providing schools in its territory with educational information on electric service. The information is being used in English and current-topics classes and in debating clubs. The local utility managers co-operate with the schools in arranging demonstration talks, visits to the plants, etc. More than 1,200 high and public schools in the State of Illinois have been reached in the distribution of this literature.

Bulletin No. 2, entitled "Electricity" and devoted to a discussion in simple language of electrical manufacture and distribution, is one of the recent forms of educational literature which is being distributed. How electricity has revolutionized industry is briefly touched on, and the way in which electrical transmission and interconnection have caused small plants to expand into sectional or state systems is explained. Some of the benefits obtained from modern methods of production and transmission are cited. It is pointed out that electricity cannot be stored in large quantities and that utilities must watch the service demand vigilantly to serve the public. Government regulations, why public utilities are built on borrowed money, the fact that the schools now hold the generation that must carry on and operate the utilities in the future are other subjects discussed. Following these are simple explanations of commonly used electrical terms, with talks on the part electricity played in preparing the bulletin and how the bulletin can be used to advantage by students.

Simplifying Transactions with the Public

By C. M. Knapp
Commercial Department Houston (Tex.) Lighting & Power Company

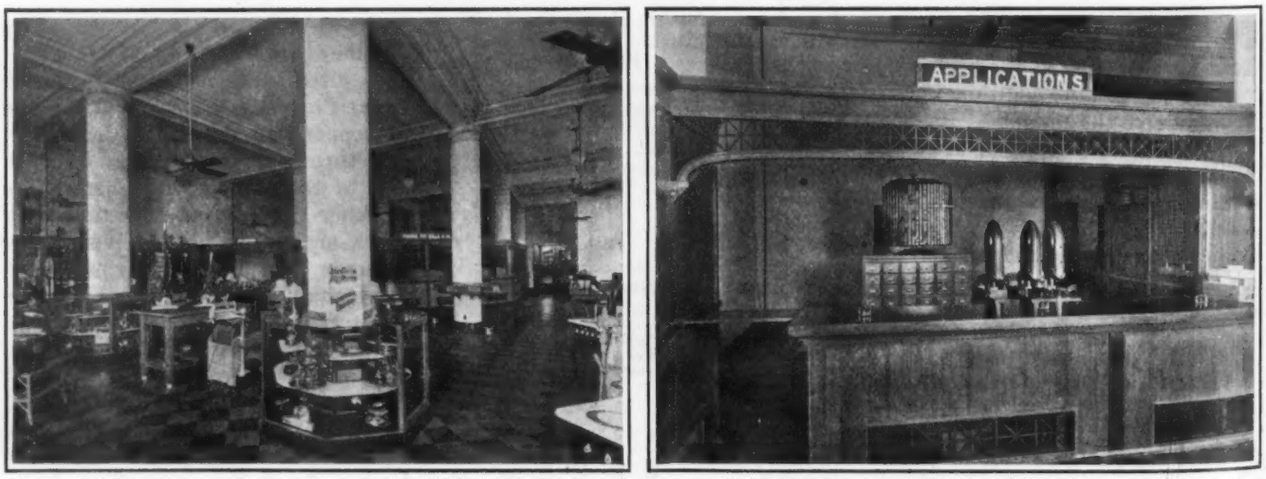
INCREASING signs of attempts to make transactions between the public and utilities as quick, convenient and agreeable as possible can be observed in nearly every section of the country. The new building of the Houston Lighting & Power Company, Houston, Tex., has been laid out with these requirements particularly in view. The main floor is devoted to merchandise display and desks at which customers make applications, pay bills or apply for adjustments of any kind.

As shown in the accompanying illustration, the application desk and cashier's windows are next to one another and plainly designated by electric signs. All transactions with the public having to do with installation, transfer or discontinuance of service are conducted at the application counter, to avoid moving the customer from place to place. If a deposit is to be received, the customer steps about three feet to the cashier's window immediately adjacent, where the money transaction is made. The clerk at the application counter sends the order to the cashier through a small window in the side of the cage. Transfer of money between the sales department and the cashier is facilitated by means of pneumatic tubes.

Actual adjustments of complaints are made in the business office of the company on the upper floors of the building. This effectively separates complaining customers from those transacting business on the sales floor.

The equipment of the application counter was selected with a view to minimizing the customer's time. The pneumatic carriers permit almost instantaneous transfer of records, orders, applications, etc., between this counter and the record department. The record department and the credit department are on the upper floors of the building. The use of this carrier service rather than the telephone results in considerable saving of the clerks' time.

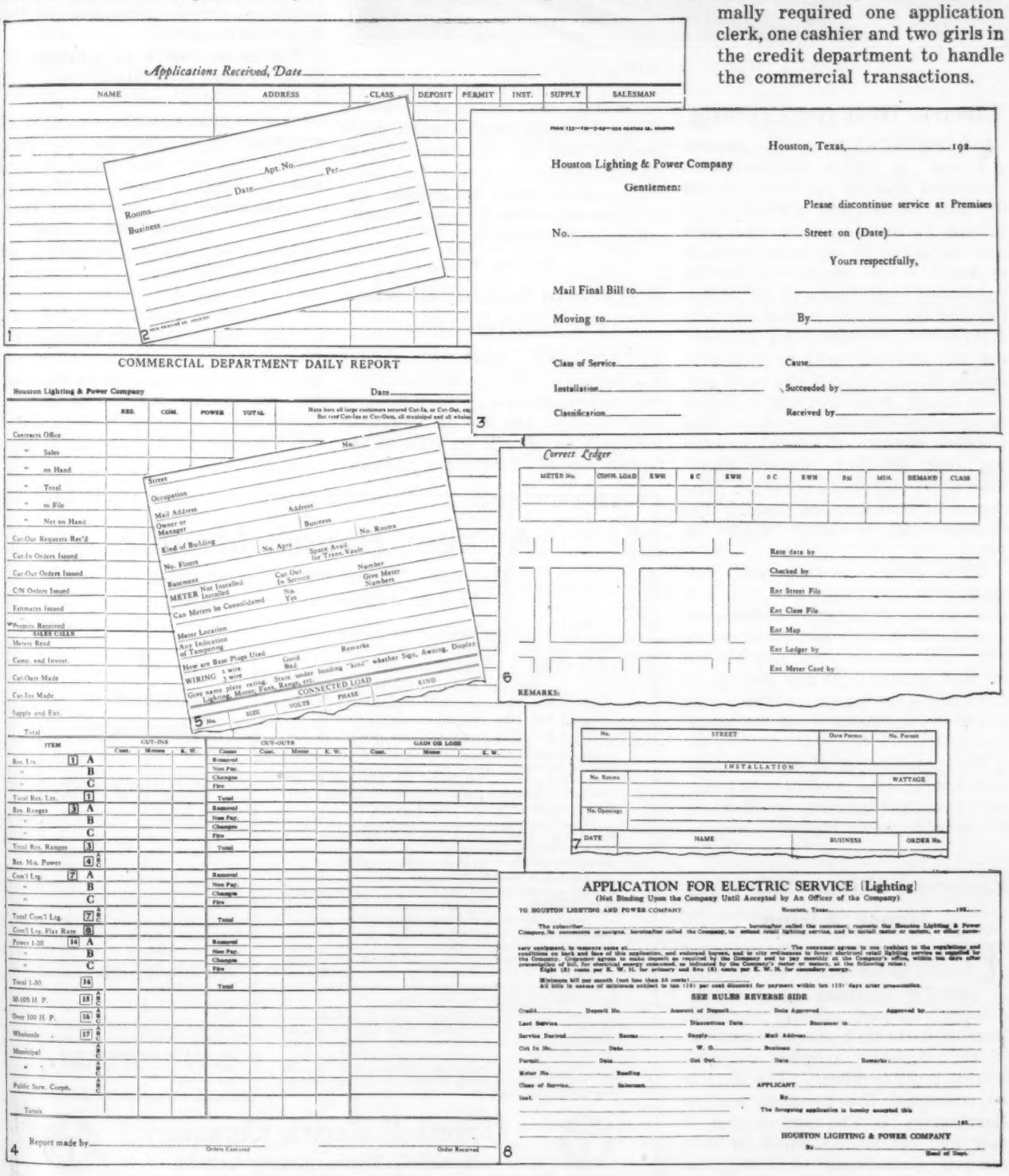
Back of the counter on the card-file cabinets can be seen a cylindrical leaf file which will accommodate fifty



AT LEFT—MERCHANDISE SALESROOM, APPLICATION DESK AND CASHIER'S BOOTH. AT RIGHT—APPLICATION DESK SPECIALLY EQUIPPED TO EXPEDITE TRANSACTIONS WITH CUSTOMERS

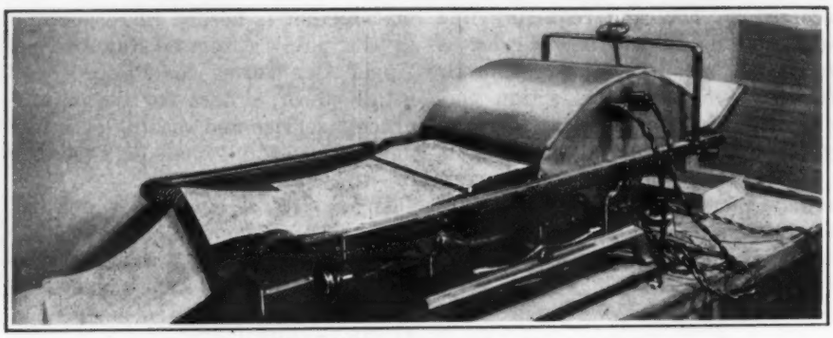
thousand addresses. In the file, arranged alphabetically and numerically, are to be found all addresses at which the company has now or ever has had service. Colored tabs or signals are inserted in the file showing the condition of electric service at any particular place. Certain colors indicate that the particular address is new with a permit not yet received, or new and requiring line construction, or whether service is residential, commercial, lighting or power. As fast as inspection permits are received the numbers are typed on the address strips for this file. The file, which has been very largely increased since the picture was taken, enables the application clerk to know at a glance information that is needed in responding to the public's request for service. Application forms for lighting and retail power, orders for discontinuance of service and records of information regarding customers' service are illustrated herewith.

In the city of Houston, which has about 225,000 population and 45,000 electrical customers, there are normally required one application clerk, one cashier and two girls in the credit department to handle the commercial transactions.



SOME FORMS AND RECORDS USED IN TRANSACTIONS WITH THE PUBLIC

1.—Record of daily applications. 2—File card of customers served. 3—Discontinue service order. 4—Daily report. 5—Record of customer's installation. 6—Reverse side of installation record. 7—Residence lighting record (residence power record on different color card). 8—Application for service (rules and regulations on reverse side).



DRYING A PRINTING JOB WITH ELECTRIC HEAT

Electric Heat for Printing

A PRACTICAL use of electric heat in which central-station industrial heating engineers should be able to interest almost every printer in their territory has been made by a San Francisco printer and engraver. The electric drier for embossing work shown in the accompanying illustration is used not only for process embossing but for drying job printing work as well. By means of this drier it has been possible to cut down the time required to put a job through the shop. The machine consists of a hood containing four 500-watt heaters placed over a variable-speed conveyor. The degree of heat and the speed of the conveyor may be varied to suit the job.

Form letters, notices, cards and other odd printing jobs, if put through the drier, can be delivered within a few hours in case of necessity. Three-color work can be run off and delivered in one day in an emergency, whereas three days would be required without the use of the drier.

This application of electric heating should prove profitable to every central-station company which has a job printer on its lines.

Electrical Homes Stimulate House Wiring

THE popularity of electrical homes, as sponsored by the Public Service Company of Northern Illinois through local electrical leagues, is shown by the construction of six completely equipped electrical homes in its territory. The first to be completed this summer was in Barrington, Ill. The total number of new and old houses wired by this company since January 1 is in excess of the number recorded for the same period of 1923. The total is more than 50 per cent greater than the figure made for the same period in 1922. Although easy payment plans are provided by the company, the majority of wiring is on a cash basis, which rather belies the general impression regarding business inactivity in this territory.

New Room Rate to Stimulate Use of Appliances

EFFECTIVE September 1, the Haverhill (Mass.) Electric Company announced a new household rate based on the use of electricity per room per month, in place of the former rate of 12 cents per kilowatt-hour. The new rate is 12 cents per kilowatt-hour for the first 3 kw.-hr. per room per month; 8 cents each for the next 5 kw.-hr. and 4 cents for all energy used above 8 kw.-hr. per room per month. The rate was put in use after an exhaustive survey of the company's residential business by the power engineering department of Charles H. Tenney & Company, Boston, managers of the Haverhill property.

The room data were obtained by meter readers at negligible cost, and 4,486 residential customers with 25,961 rooms and an annual energy consumption of 852,583 kw.-hr. were listed. The new rate makes it possible for every householder to operate appliances at a rate lower than the former lighting rate and also to receive this rate independently of the size of the house. All energy is measured by one meter, making every outlet an appliance outlet. In a typical case a six-room house using 25 kw.-hr. per month paid $3 under the old rate, whereas under the new rate the charge will be 18 kw.-hr. (6 rooms × 3 kw.-hr.) at 12 cents and 7 kw.-hr. at 8 cents, or a total of $2.72.

A New Household Rate

Designed to reduce the cost of operating Electric Appliances in the home.

We have the pleasure of announcing a new household rate, effective September 1, and applying to all bills rendered on and after October 1.

The New Rate is as follows:

First 3 Kw. Hrs. per room per month @ 12c
Next 5 Kw. Hrs. per room per month @ 8c
Over 8 Kw. Hrs. per room per month @ 4c

In computing the number of rooms, hallways, entries' porches, bathrooms, closets and rooms which have no electric outlets, are not included. The "minimum home" is considered as having three rooms. The minimum yearly charge remains unchanged—nine dollars a year.

This Household rate makes it possible for every householder to (1) operate electric household appliances on a rate lower than the lighting rate; (2) to receive this lower rate whether the house is large, medium or small.

The rate is based on the number of rooms in order to equalize opportunities between owners of large houses and of small houses.

Because the rate is based on the electricity used per room per month, the individual with the small house has the same opportunity as the one with the large house. Each pays at the rate of 12c for only the normal amount of current his home would use for lighting; each, therefore, without regard for total amount of electricity used, has equal chance to receive the lower rates.

Here is an example of how the new Household rate applies. A six-room house using 25 Kw. Hrs. per month would pay, at present lighting rate, 25x12c=$3.00. Under the new rate the charge for electricity would be 18 Kw.Hrs. (6 rooms x 3 Kw.Hrs.) at 12c, for the other 7 Kw.Hrs. at 8c, a total of $2.72—a saving of more than 9%, an average rate of less than 11c.

4 Outstanding Advantages

1
Permits the use of appliances in the home at rates much lower than the lighting rate.

2
Enables the small householder to receive as low a rate as the large householder.

3
Measures all current through one meter—hence saves the cost of wiring for a second "appliance" meter and makes every outlet an appliance outlet.

4
Reduces the rate for electric lighting whenever the electricity used for that purpose is in excess of 3 Kw. Hrs. per room per month.

Haverhill Electric Company
Haverhill, Mass., August 1, 1924

CIRCULAR EXPLAINING NEW RATE SENT TO RESIDENTIAL CUSTOMERS

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Large Pelton Waterwheels — The largest single-wheel and single-jet Pelton waterwheels in existence have been installed in an Italian power house in Venaus. The plant contains four turbine-generators, each rated at 26,000 hp. at 500 r.p.m. The machines operate under a hydraulic head of 3,400 ft. and consume each 2,430 liters (about 2½ tons) of water per second. The wheels of the turbine have a diameter of 115 in. and carry twenty cast-steel buckets. At full load a hydraulic efficiency of 84 per cent is reached. Needle nozzle and deflector regulation, actuated by a powerful servo-motor, prevent any noticeable pressure increase in the pipe line in case of a sudden loss of load. Photographs and several sectional drawings of these large turbines are given.—*Wasserkraft*, July 15, 1924.

Power and Process Steam from By-product Producer Gas.—C. H. S. TUPHOLM.—Considerable interest is evidenced in Great Britain and Europe in a new system of producing both power and process steam for use in chemical plants, paper mills, soap factories and similar industries. It is claimed by the inventors that the costs of power and process steam generated by this system are considerably less than by the methods generally obtaining. The operation of the plant involves three main factors—(a) gasification of coal by the low-temperature gasification (not carbonization) process, (b) generation of steam at high pressures in special gas-fired boilers guaranteed to give regularly 85 per cent thermal efficiency, and (c) production of power by means of extraction of bleeder turbines delivering the bled steam at low pressure to processing plants as well as a small percentage to the plant for use in gasification. — *Chemical and Metallurgical Engineering*, August 25, 1924.

Generation, Control, Switching and Protection

Factors Affecting the Working Costs of Small Electric Generating Sets.—E. G. KENNARD.—The author shows how the working costs per unit of electricity are influenced by various factors, as the type of engine, nature and magnitude of load and price and calorific value of fuels. Internal-combustion engines only have been considered in this comprehensive article.—*Journal of Institution of Electrical Engineers (England)*, August, 1924.

Selective Protection.—M. SCHLEICHER.—The principle of this unusual selective relay protection for power plants and substations which feed extensive networks is as follows: If a feeder, a transformer or a generator becomes overloaded, the usual protective relay disconnects this part of the station. The new device takes a part of the load away from the unit, or, expressed differently, an over-current relay does not act here directly upon the breaker of the feeder, transformer or machine, but upon a part of the breakers of the feeders from these, accomplishing thus a relief of load. Not until this partial relief has proved to be inadequate is the entire unit cut off. The principle is explained with three examples from actual plants operating with such selective relays. Connection diagrams for these three examples are given.—*Elektrotechnik und Maschinenbau*, July 20, 1924.

Lightning-Arrester Application from the Economic Standpoint. — A. L. ATHERTON.—All factors connected with arrester uses are given assumed dollar values and a resulting group of curves is presented which indicates the field where it would be economical to install the different types of arresters. These studies are based on assumptions and give only results based on these assumptions and average conditions. The method of attack, however, is generally applicable to the problem.—*Journal of A. I. E. E.*, September, 1924.

Transmission, Substations and Distribution

Overloads on Oil-Cooled Transformers.—F. SIEBER.—A formula is derived which gives in a simple way the safe permissible overload and its duration for oil-cooled and air-cooled transformers which previous to this overload have been operating only partially loaded, or when the cooling medium (water or air) is of a temperature less than the maximum. At first the so-called time constant of the transformer is calculated—that is, the time required by the machine to reach stationary temperature at full load. This requires a knowledge of the segregated losses, the weight of active material and the oil volume. With this value known, a logarithmic equation gives the permissible overload for any previous partial load. Tabulations and curves are given wherein a great many of these values are computed for average transformers between the limits of 20 kva. and 1,600 kva. and voltages not exceeding 25,000. — *Elektrotechnische Zeitschrift*, July 17, 1924.

Diesel Electric Plants for Rural Centers.—Y. LE GALLOU.—A general electrification of France, including power supply to eight thousand or ten thousand rural centers, with a farming population of about five and one-half million people, cannot be expected from the existing and planned hydro-electric and steam stations and their trunk lines. The relatively small power demand of these centers does not warrant the expense of a special high-tension branch line, and even if the main trunk should pass directly through the settlement, the cost of a step-down transformer for such small capacity would be uneconomical. The author recommends following the example of Denmark, where excellent results have been achieved through the operation of small Diesel-electric power plants with capacities of 60 kw. to 2,000 kw. The simplicity of a modern Diesel motor causes it to require a minimum of attendance, the consumption of fuel oil is only about 200 grams per horsepower-hour, and the cooling water required does not exceed 2 kg. per horsepower-hour. The author gives data for an estimated eelctrification of a rural center with thirty thousand inhabitants. Based upon statistical data, an installation furnishing annually 487,000 kw.-hr. would be sufficient in this case. This is provided by two units of 160 kw. and two of 65 kw., leaving ample reserves.—*Revue Générale de l'Electricité*, July 26, 1924.

Units, Measurements and Instruments

Wave-Form Examination with the Cathode-Ray Oscillograph.—N. V. KIPPING.—As compared with the older vibrating-strip type of instrument, the cathode-ray oscillograph has many advantages; for instance, its ability to deal with radio frequencies and its two-directional control over the vibrating element, the cathode ray. For wave-form examination with this oscillograph one pair of deflecting plates is used for obtaining the unidirectional deflection from the variant to be examined, while across the other pair of plates some electrical circuit is connected which will deflect the "spot" in a direction at right angles to the motion. Various problems that have been encountered in the use of this oscillograph for wave-form examination are considered and the method of overcoming them is discussed. — *Electrical Communication*, Vol. 3, No. 1.

Test Code for Solid Fuels.—This code is a preliminary draft of a code in the series formulated by the A. S. M. E. committee on power test codes. The test code for solid fuels covers all important fuels which are used for the production of steam for power, heat and other industrial and domestic uses. Methods of collecting samples of fuel, laboratory sampling and analysis, classification of solid fuels, flue gas, smoke combinations, ash and powdered coal are among the most important subjects covered.—*Mechanical Engineering*, September, 1924.

Instruments for Detecting Infra-Red Radiation.—D. S. PERFECT.—The author considers the theory and construction of several instruments which were designed in the course of an extended research in connection with the detection of infra-red radiation. The instruments considered are a strip galvanometer, a thermal expansion instrument, a thermometric balance, a modified Paschen galvanometer and a thermo-junction.—*Journal of Scientific Instruments*, August, 1924.

Motors and Control

Central-Station Energy in Utah Coal Mines.—M. L. CUMMINGS.—Electricity has played an important part in the development of Utah's coal mines. It might seem that a coal-mining company with a large supply of cheap fuel would be in an excellent position to generate

its own electric power. That such is not the case, as is shown by the fact that the majority of the mines purchase energy from a central-station company, is brought out by the author, together with the operators' reasons for relying upon utility company service. The author describes how fifteen producing coal mines utilize energy purchased from the Utah Power & Light Company. — *Journal of Electricity*, August, 1924.

Tests of Mechanical Soot Blowers.—ROBERT JUNE.—Because of the many variables, it is difficult to determine the savings effected by mechanical soot blowers as evidenced by reductions in flue-gas temperature. The tests described are believed to be among the most comprehensive and thorough that have been made and should be of particular interest as they confirm some of the general claims put forward strictly from the fuel-saving point of view.—*Power*, August 26, 1924.

Electric Drive of Rolling Mills.—A. HARTMANN.—The extreme simplicity of the three-phase induction motor makes this type of motor the most desirable for the severe duty in rolling mills. The relative advantages of induction-motor drive by the Krämer and Scherbius systems are discussed, and diagrams of a number of variations are given. For speed regulation of more than about 50 per cent only direct-current drive is recommended, and large mercury-arc rectifiers seem to be favored increasingly by rolling mills to change the existing alternating current to the required direct current.—*Brown-Boveri Mitteilungen*, July, 1924.

Heat Applications and Material Handling

Electric Brass Melting. — ROBERT JUNE.—The Federal-Mogul Corporation's Detroit installation of five electric furnaces with a capacity of 200 lb. to 250 lb. each is a striking example of the efficiency of the modern electric furnace. As high as twenty-two heats per eight-hour working day have been obtained, compared with five heats for the coke-fired furnaces also used by this company. The quality of metal from these furnaces is also superior, and the life of the furnace linings at these high production rates is considerably longer than would be expected. From 1,200 to 1,400 heats seems to be a minimum lining life, with 2,000 heats as a possible average. The electrode consumption is 3.7 lb. per ton melted, and the power consumption averages 325 kw.-hr. per ton of metal.—*Iron Age*, August 14, 1924.

Types of Cranes for the Power Plant.—In engine and turbine rooms where sufficient head room can be provided the favored way of handling heavy machinery is by means of an electric traveling crane. This type of crane consists of two bridge girders which are carried at each end by a truck. The trucks are of either two-wheel or four-wheel construction and rest upon rails securely fastened to the main runway girders. Specific dimensions and weights of electric traveling cranes with capacities from 5 tons to 50 tons are given. Locomotive cranes and coal-handling equipment are also considered.—*Power Plant Engineering*, August 15, 1924.

Operation of Electric Elevator Machines.—F. A. ANNETT.—The author explains the operation of semi-magnetically controlled elevators, describes the different automatic stopping devices now employed and tells how to adjust the terminal landing limits.—*Power*, September 9, 1924.

Traction

Modern Methods in Train Dispatching.—J. C. LATHAM.—The successful adaptation of the telephone to the purpose of train control has required the solution of many problems that in the commercial telephone system do not need to be considered. The comparatively great distance between stations makes the use of individual lines impossible on account of the great expense of both installation and maintenance. The only practical method has been found to be the placing of a number of stations on the same telephone line. This had at first the drawback that it necessitated a complicated system of code ringing, but the drawback has been obviated by the use of a selector consisting of a simple electromagnetically operated sending mechanism which permits calling any station without affecting any other. Various installations of train-dispatching telephones that are in commercial use are described, with a review of the progress of train dispatching in the most important countries of the world.—*Electrical Communication*, Vol. 3, No. 1.

Recording Locomotive Characteristics by the Ortheograph.—P. M. GILLILAN.—The ortheograph consists of one or more steel ties with indicators on each end which record the reaction of locomotives and cars on the track and show the impulse of each wheel on the ends of every tie. It shows on a graphic record the amplitude and characteristics of both the vertical and transverse flange thrusts of all the wheels on each rail, the running, equalization and rolling characteristics of the locomotive and cars; the comparative vertical and lateral flange thrusts at different speeds, and the loading of every wheel in the train. It detects flat spots on wheels and shows on which wheel they exist and it indicates any transfer of weight or any tilting in the locomotive driving trucks and its extent. A description of the device is given.—*Railway Age*, August 16, 1924.

Telegraphy, Telephony, Radio and Signals

Telephone Transmission Unit.—R. V. L. HARTLEY.—A new transmission unit other than the standard mile is being adopted by the American Telephone & Telegraph Company. The attenuation either of power or current corresponding to the mile of standard cable is directly proportional to the square root of the frequency of the term under consideration. This means that the standard cable mile corresponds not only to a certain volume change in the reproduced sound but also to a distortion change. This twofold effect of standard cable is desirable on most commercial circuits, but at present many types of circuits are being used which have much less distortion than standard cable. Moreover, it has become the general practice to determine the efficiency of circuits and apparatus on the basis of measurement and computations for single-frequency current. The transmission unit has been chosen so that two amounts of power differ by one transmission unit when they are in the ratio of 10^1, and any two amounts of power differ by N units when they are in the ratio of 10^{N1} power. The number of transmission units corresponding to the ratio of any two powers, P_1 and P_2, is then the common logarithm of the ratio P_1/P_2 divided by 0.1—*Electrical Communication*, Vol. 3, No. 1.

Thermionic Valves with Dull Emitting Filaments.—M. THOMPSON and A. C. BARTLETT.—An account is given of the development of the thermionic valves containing thoriated tungsten filaments. Intrinsic properties are described and discussed.—*Journal of Institution of Electrical Engineers (England)*, August, 1924.

Miscellaneous

Iron and Steel Convention.—This entire issue is given over to the program, manufacturers' exhibits and convention papers presented at the nineteenth annual convention of the Iron and Steel Electrical Engineers in Pittsburgh, September 15-20. The papers referred to are abstracted elsewhere in this issue of the ELECTRICAL WORLD.—*Iron and Steel Engineer*, September, 1924.

Insulation of Coil-Wound Wires.—U. RETZOW.—From a large collection of experimental data conclusions are drawn concerning the electrical properties of coil-wound copper wires in regard to their insulation. Conductors covered with a single and a double layer of silk and with enamel show that a double layer gives much less than twice the resistance of a single layer and that enamel is vastly superior. Coils wound with wires which have been dipped in lacquer, beeswax or compound show a greatly inferior insulation. It is assumed that by dipping the insulated wire into the warm-liquid impregnating mass only a part of the humidity is expelled and the rest is entrapped and cannot be expelled. The resistance decreases according to an exponential law with increasing temperature, which is particularly pronounced on the compound-treated wires. Better, but chemically much more complex, conditions arise if coils are wound with untreated insulated wires and the finished coil is subsequently compound-treated in a vacuum under heat. The occurrence of a green discoloration of the organic insulation is frequently observed in this process and has been closely investigated by the author. It has been traced to a partial dissociation of the wax component of the compound, forming more or less active acids. Once this acid formation has started, it attacks the organic insulation in a constantly progressing manner until it is destroyed. A complete protection against this slow destruction has not been found as yet.—*Elektrotechnik und Maschinenbau*, July 13, 1924.

Scientific and Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Calorimeter Based on Selenium Cell

In order (1) to eliminate the "personal equation," (2) to work with more widely varied dilutions, and (3) to increase the range of calorimetric method to greater concentrations, a device has been constructed in which galvanometer readings are substituted for visual color comparisons. In the present form of apparatus, selenium sensitive to light is used. The relative light absorptions of different substances may be measured by the variation of the galvanometer readings in a circuit which includes the selenium cell.—*Department of Chemistry, University of Pittsburgh, Pa.*

Dielectrics, Standard Tests for

Detailed instructions have been developed for standard tests on dielectric strength, dielectric power loss, power factor of charging current, acidity of oils and for various physical tests on untreated insulating paper. See the 1924 report of committee D-9 of the American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa.

Frequency Meter, Three-Phase

Two coils are mounted one inside the other and at right angles to each other. These coils and a condenser (or inductance) are connected in Y across a three-phase line. A high non-inductive resistance is in series with each coil. The moving element consists of a soft-iron vane. For details and theory see the *Penn State Engineer* for May, 1924.—*Leonard A. Doggett, State College, Pa.*

Glare, Study of

An experiment was made to determine the relative properties of prismatic window glass and adjustable louvers for reducing glare resulting from skylight entering windows. It was found that prismatic glass can be utilized to direct a large percentage of skylight to the lower or to the upper part of a room with a resultant decrease of glare, but that the most complete control can be secured with louvers.—*Hydro-Electric Power Commission, Toronto.*

Measuring Instruments, Graphic, High-Speed Chart for

A line of graphic meters has been developed having an arrangement by which the chart speed is increased at the start of a line disturbance. The chart operates at 3 in. per hour under normal conditions, but as soon as a disturbance occurs the speed increases to 3 in. per minute, thus insuring a detailed record of conditions in times of disturbances and of value in analyzing causes. Four kinds of instruments are equipped with this feature — ammeters, voltmeters, wattmeters and power-factor meters.—*Esterline-Angus Company, Indianapolis, Ind.*

Ohmmeter, Based on Kelvin Bridge

For several years past there have been occasional requests for a portable shop and laboratory instrument which would measure with fair accuracy resistances as low as 0.0001 ohm. Such an instrument has now been developed and, we hope, will be of considerable service, for example, in the measurement of armature coils and other low-resistance windings; of carbon and graphite rods; for determinations of conductivities of composite metallic conductors such as galvanized iron or duplex wires; for resistances of pure metals, such as copper, aluminum and iron wires and copper busbars.—*Leeds & Northrup, Philadelphia.*

Steels, Chromium-Nickel, Non-Rusting

Two groups of chromium-nickel steels have been developed, one of martensitic structure, the other of austenitic structure, both non-corrosive. These materials have a wide scope of useful, practical applications. For details see a paper presented before the 1924 annual meeting of the American Society for Testing Materials.—*B. Strauss, Fried. Krupp, A. G., Essen, Germany.*

Time Meter for Electric Circuits

In the life testing of incandescent lamps it is important that the total time each lamp is in circuit be accurately known. While this information can, of course, be obtained from a clock, there is a possibility of mistakes, for example, in the case of an interruption to the circuit, particularly if this interruption should occur at night. With a view to simplifying this phase of the work, there has been designed a special time counter which reads continuously the time in hours and decimals thereof that the testing circuits are alive. Upon placing a batch of lamps on test it is necessary only to read the dials of the instrument, and this reading, subtracted from the indication at the end of the run, gives the actual time the lamps in question were carrying current. For a detailed description of the device see the *Bulletin* of the Hydro-Electric Power Commission of Ontario, 1924, page 221. — *P. A. Borden, Toronto.*

In Progress or Purposed

Concrete, Research on

The large number of data already obtained through past experimental investigations was carefully reviewed during the year, re-analyzed in many cases, and an attempt made to appraise our present knowledge of the properties and performance of concrete. As a result of this it was found that certain important information was lacking which would be of great economic value to the commission. Accordingly, a program of investigations in concrete and concrete materials, to be carried out over a period of years, was developed to supply this information. This program is now under consideration.—*Hydro-Electric Power Commission, Toronto.*

Insects, Protection Against, with Sprayed Metal

In warm climates wood is attacked by white ants, and lead-cable sheathing suffers from the cable borer. The latter cuts his way through lead with ease if he can find a suitable fulcrum from which to work. A possible method of keeping insects out would be by covering the cable or wood at points likely to be attacked with a coating so hard that they could not bore through it. Infected wood containing beetles about ready to emerge has been supplied by the Department of Agriculture and has been sprayed with various metallic coatings to find out whether the beetles can cut through the metal.—*Bureau of Standards, Washington, D. C.*

Magnetic Analysis of Twist Drills

In connection with the work of the committee on magnetic analysis of the American Society for Testing Materials, studies have been made on twist drills made of high-speed steel to correlate their mechanical and magnetic properties (non-destructive tests). During the work information was obtained which indicated that further testing under higher frequencies and lower magnetizing forces may give results of value and remove the limitations now observed. But, above all, the test results have served to crystallize the opinion of the committee that this investigation is essentially one of research and that therefore it is highly important, as the next step, to scrutinize carefully the inherent magnetic and electrical characteristics of high-speed steel. The decision has been reached to obtain a series of specimens of this steel, of uniform cross-section, which will permit of the determination of the fundamental magnetic and other physical data under various conditions of heat treatment.—*Frank P. Fahy, New York City.*

Metals, Polished, Effect of Ultra-Violet Light on

Ultra-violet light appears to accelerate the atmospheric corrosion of polished metal surfaces. That is, portions of the metal exposed to light have become tarnished while parts which were not exposed have remained bright. These results may lead to the development of a method for indicating the liability of metals to corrosion or the formation of a superficial oxide film. A few specimens of steel and brass have been prepared and the work will be continued.—*Bureau of Standards, Washington, D. C.*

Transmission Lines, Regulation and Efficiency of

A study of the efficiency and regulation of transmission lines carrying large blocks of power for long distances and at different frequencies is being made in anticipation of the future requirements of the commission.—*Hydro-Electric Power Commission, Toronto.*

Suggestions for Research

Boiler-Room Investigations

Although modern research has contributed a great deal to improved operation in the boiler room, there is still much to be done in this respect. Among some of the problems that should be studied are: Efficiency of burning various pulverized fuels, e.g., lignites, low temperature coke and mixtures of cokes with coal, anthracites, etc.; design of combustion space, special refractory materials, water screens, water-cooled walls and handling of ash; cost of installation upkeep, comparison with similar plants using stokers, operating efficiencies, disposition of ash, etc.; pulverizing costs and methods; complete gasification of pulverized coal; coal driers, design and fire hazards; low-temperature carbonization of coal; improved methods of coal carbonization; improvement of coke and better utilization of by-products; furnace conditions governing application of refractories; development of better refractories.

Cables, High-Tension, Dielectric Loss Test

While it would be of advantage to test three-phase power cables for dielectric loss and power factor from a three-phase source, such a test is quite difficult at voltages of more than 50 kv., in view of the very low power readings and instrument transformers involved. It is desired therefore to establish a set of empirical co-efficients by which single-phase test results could be multiplied to obtain approximately the loss to be expected in the three-phase operation of the same cable.

Illumination, Reflection Factor in

A photometric problem of growing importance is that of reflection factor, which has quite a bearing on the relation of room finishes to the effectiveness or economy of lighting. Many of our earlier data were incorrect owing to an error in the determination of the reflection factor of the material widely used as the basis of comparative measurement. While this has now been corrected, we still need better standardization of method and an assurance that the results from different laboratories are comparable.—*G. H. Stickney, Harrison, N. J.*

Synchronous Machine, Armature Reaction in

The armature reaction in a salient-pole machine can probably be studied by sending direct current through the armature and keeping the pole pieces stationary in different positions. The direct and transverse reaction may be determined by exploring the magnetic flux density in the air gap. The torque can also be determined as a function of pole position. The coefficient of transverse reaction could be deduced from the ratio of the fluxes, with the poles placed in the 0 deg. and 90 deg. positions.

News of the Industry

Franklin Institute's Centenary Program

Noteworthy Addresses from Famous Men Signalize Celebration at Philadelphia—University of Pennsylvania Confers Six Honorary Degrees

SIX of the participants in the centenary celebration of the Franklin Institute in Philadelphia last week were made the recipients of the honorary degree of doctor of science, conferred on them by the University of Pennsylvania. Those thus distinguished were Sir William Henry Bragg, professor of physics in the University of London; William Charles Lawson Eglin, chief engineer of the Philadelphia Electric Company and president of the Franklin Institute; Dr. Charles Fabry of the University of Marseilles, France; Sir Charles Algernon Parsons, inventor of steam turbines; Edwin Wilbur Rice, Jr., president of the General Electric Company, and Dr. Pieter Zeeman, rector magnificus and professor of physics of the University of Amsterdam.

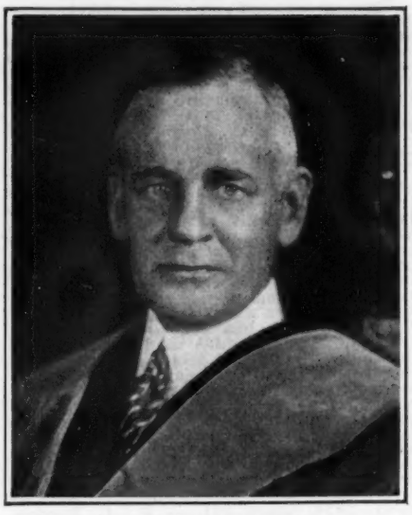
Among the outstanding features of the celebration, in addition to the address of Dean Dexter S. Kimball of Cornell, alluded to in these columns last week, were the address on "The Fifth Estate" by Dr. Arthur D. Little, chemical engineer of Cambridge, Mass.; E. W. Rice, Jr.'s, address on "Research by Industrial Institutions," and the speech of Dr. Fritz Haber of Berlin at the banquet.

"The Fifth Estate"

Dr. Little explained why he had chosen the term "fifth estate" to designate scientific workers and expressed his conviction of the need for "the many who cannot think to learn to trust the few who can." "The guiding principle of the fifth estate," he said, "has ever been one of service. The scientist himself does not reap the benefit of his discovery. It is the world which enjoys the fruits of his toil. But he does not grudge it. The knowledge of his work well done is his reward; the satisfaction of a good deed, which will have lasting effects upon the development of civilization, is enough for him."

Dr. Little estimated the number of creative scientists in the world today as not more than one hundred thousand. "Inasmuch as it is supposed to cost $500,000 to produce one scientist, I should call this the highest initiation fee on record," he added. "If scientists are so valuable, why should they not be better cared for?"

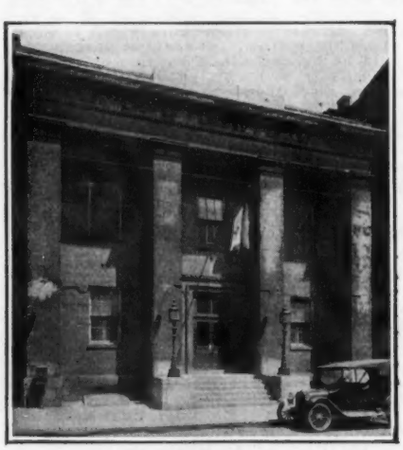
Mr. Rice, after a glance at progress of research from Benjamin Franklin to Roentgen and the Curies, spoke of the Thomson Research Laboratory of the General Electric Company at Lynn, Mass., started by Elihu Thomson more than forty-two years ago. Among its notable achievements, mainly due to the genius and industry of its founder,



W. C. L. Eglin,
President Franklin Institute

he named electric welding and investigations of alternating-current repulsion phenomena, flame arcs, constant-current transformers, lightning arresters and integrating wattmeters. The high-potential laboratory at Pittsfield also came in for notice, with a reference to the experiments of Steinmetz and Peek, and the success of the pure-science laboratory at Schenectady under the direction of Dr. Willis R. Whitney was recounted. Its field of work, said Mr. Rice, includes, among other things, vacuum tubes, X-ray tubes, electronics, incandescent lamps, kenetrons, X-ray spectrum analysis, insulation, ionization, radio research, vibrations and strains and ferrous and non-ferrous alloys.

The famous laboratory of Edison,



Franklin Institute, Philadelphia

started in Menlo Park, N. J., was not forgotten, and Mr. Rice expressed the wish that the inventor could be persuaded to write the story of the development of his nickel-iron battery. The co-operation of manufacturers and public companies in research work, the field work done by university research departments—for instance, Prof. Harris J. Ryan's investigations into corona effects—and the accomplishments of the National Research Council came in for praise from the speaker, who dwelt also on the perseverance and long-continued effort necessary in achieving results, telling how two men had worked for ten years to improve carbon brushes. In conclusion, he asked why the essence and spirit of scientific research—freedom from prejudice, careful observation, honest and truthful interpretation—could not be applied in the economic and political arenas to bring lasting peace and the higher intellectual and spiritual development of man.

Dr. Haber, who developed the Haber process of nitrogen fixation, paid a tribute to American science, saying that the United States had passed through the early periods of commercial and technical progress to a time of ripe culture which made it not the aspiring pupil but the younger colleague of the representatives of older schools in other lands. "The banker and lawyer, the industrialist and merchant, in spite of their leading positions in life," said Dr. Haber in concluding his remarks, "are only administrative officials, and the sovereign is natural science. Its progress determines the measure of the prosperity of man; its cultivation is the seed from which the welfare of future generations grows."

Other Features

Among the many other noteworthy features of the three-day celebration, at which as many as four parallel sessions were at times proceeding simultaneously, were the address by Prof. W. F. G. Swann on a new theory regarding the origin of the earth's electric and magnetic phenomena, discussions of the electronic theory by Prof. Pieter Zeeman of Amsterdam, Prof. John S. E. Townsend of Oxford and Sir Ernest Rutherford of Cambridge, an account of the mercury turbine by Dr. William L. R. Emmet of Schenectady and an explanation by Sir William H. Bragg of his investigation of crystal structure by the agency of the X-ray. Nearly fifty papers on engineering and scientific subjects were presented in all, and eight hundred men and women attended the sessions. Elihu Thomson, Frank J. Sprague, A. E. Kennelly, John J. Carty, Irving Langmuir, William D. Coolidge, Major-General G. O. Squier, Harold Pender and F. W. Peek, Jr., were among the American electrical engineers and professors who contributed papers or made addresses.

New York Boosts Home-Lighting Campaign

Plans of Lighting Educational Committee Receive Enthusiastic Indorsement of Local Electrical League at Record-Breaking Meeting

TO LISTEN to the plans of the Lighting Educational Committee's home-lighting campaign, the New York Electrical League on Wednesday of this week held what was said to be the largest meeting of New York electrical men and women ever gathered together. It was the first regular luncheon meeting of the league this season, and more than seven hundred were present, including men from all the electrical utilities in the New York district and adjacent New Jersey. Arthur Williams, regional director of the campaign, presided and announced what has not been generally known, that the father of the idea of this essay campaign among school children was Rex Cole, president of the Miller Company of Meriden, Conn., a member of the New York League. Frank W. Smith, vice-chairman for the New York district, presented plans for the local activity, announcing that a model home, where children will be enrolled, will be erected at the New York Electrical Show next month as headquarters for the contest.

P. B. Zimmerman made the principal address, discussing the purposes and picturing the progress of the campaign. The fact that 25 per cent of the school children today have defective eyesight, he said, has made this more than an industry movement. Its appeal has been universal, and already more than 2,800 communities have taken up the campaign and are organizing local essay contests. The extent to which the schools are responding has been extremely gratifying. In Maine and in Michigan, for instance, the state superintendent has urged it upon all the local authorities, and it has been made mandatory in the schools of Detroit. The Roman Catholic Bishop of the Detroit diocese has supported it through the parochial schools. Local committees are urged, however, not to press unduly their desire to give out the lighting primers through the schools, where local school boards do not welcome the idea, but to avail themselves of other methods of distribution.

In California, the speaker said, the industry has gathered solidly behind the campaign and guaranteed that every school child in the state will receive a primer. Cities in New Jersey, Missouri and other states have already made the lessons on home lighting class work and are arranging for lectures by electrical men. These cases are typical. More than a million primers have already been furnished to local committees, and the orders for campaign material, totaling now over $100,000, are being filled promptly as received. The national advertising has begun, and already children are applying for enrollment, all over the country.

James H. McGraw, called upon to "pronounce a benediction," spoke of the inspiration inherent in such a meeting of men and women of the great electrical industry gathered in the spirit of service to the public. In America, he said, men are not unaccustomed to fighting for principles, and a very vital principle has been the right to progressive education. Electrical men are now engaged in a broad campaign that is directly in tune with the spirit of service to education and is pointing the way perhaps to the next great step in the progress of the electrical industry. To accomplish this in a big way, there must continually be more harmony, more co-operation, more service to the people, and such service will always bring its reward so long as it is based upon principles of truth, right and justice.

Boston Plans an Electrical League

Rapid progress is being made in the organization of an electrical league at Boston, all branches of the industry having shown active interest in a preliminary meeting at the Edison Service Buildings September 18, which was addressed by William L. Goodwin of the Society for Electrical Development, H. F. Wallace of the Edison Lamp Works, General Electric Company, Boston; L. R. Wallis, sales manager, and Julius Daniels, illuminating engineer, Boston Edison company. H. B. Gilmore, manager Western Electric Company, Boston, presided, and J. J. Caddigan, assistant to the general superintendent, Boston Edison company, was made secretary. An attendance of 160 was recorded.

Frank S. Price, president Pettingell-Andrews Company, Boston, was named as chairman of the organization committee, and permanent sub-committees were named as follows: For central stations, W. H. Atkins, Cyrus Barnes and F. E. Goulding; jobbers, Karl L. Norris, T. E. Burger and George H. Wahn; contractor-dealers, Frank L. Barnes, Otis L. Hawes and Chester T. Bliss; manufacturers, George H. Cox, T. S. Knight and W. S. Davis. A second meeting is scheduled for October 16 at the Edison Service Buildings in Boston.

Ask Hydro Permits for Kentucky and Carolina Plants

The Louisville Hydro-Electric Company has applied to the Federal Power Commission for a preliminary permit covering a project on Green River in Hart County, Ky. It is proposed to erect a 100-ft. dam near Mammoth Cave. This would create a storage reservoir 25 miles long, which would have a capacity of 11,500,000,000 cu.ft.

The Central Carolina Power Company has applied for a preliminary permit covering a project on Broad River in Richland, Fairfield and Lexington Counties, S. C. It is proposed to erect a 32-ft. concrete dam at Frost Shoals. The resulting reservoir would cover 22,000 acres. A second dam 34 ft. high is planned near Little River. It is estimated that 6,500 hp. will be developed.

The South Carolina Power Company has applied for a preliminary permit covering a project on the Saluda River, where it is planned to develop 15,000 hp. A dam 120 ft. in height is to be erected at Bachras Shoals, where a reservoir covering 12,000 acres will be created.

Niagara Rental Fixed

New York Water Power Commission Puts Price of Excess Diversion at 50 Cents per Hp.

THE New York State Water Power Commission, which has not functioned very actively owing to the lack of a fixed state policy, held a meeting at Albany on Monday, September 22, one of the objects being to determine the rental charge for diversion of water at Niagara River in excess of 15,100 cu.ft. per second, the excess amounting to 4,400 cu.ft. The commission was authorized by the Legislature of 1922 to determine the sum to be paid. The Niagara Falls Power Company, the company directly concerned, was represented at the hearing by Morris Cohn, Jr., and the Niagara, Lockport & Ontario Power Company, the largest user of the excess power, by Fred B. Corey. Chemical manufacturing companies and cities interested were also represented. Buffalo and Niagara Falls protested against a rental charge.

The commission, of which only three of the five members were present, handed down a decision on the following day fixing the rental at 50 cents per horsepower with the stipulation that the company itself should pay it and not pass it on to the distributors. The company's representatives had argued that the law requiring the fixing of such rentals was not mandatory and that the charge, if enforced, would only be passed along to the ultimate consumer.

Representatives of the Niagara Power Company said they were without power to accept or protest the commission's ruling, but would lay the question before the company's board of directors. They said the commission would be informed of the company's decision within a few days.

OTHER PROCEEDINGS

Another matter to come before the commission related to steps to enforce collection of $19,125 per year in rentals assessed against the St. Lawrence River Power Company, Massena, N. Y., which has a submerged weir at that point. This sum was fixed by the commission in 1921, but the company has up to date refused to pay. Because of the absence in Europe of A. V. Davis, president, and Fred G. Rickey, engineer of the St. Lawrence company, action was postponed until their return next month.

Fifteen applications for use of surplus canal waters were referred to the Superintendent of Public Works, because since the filing of the applications the Legislature provided that all surplus water of the canal should be developed by him, thereby taking jurisdiction from the commission.

Two applications of Thompson &

Porter for a license to develop Niagara River waters were also denied, as was the application of the Moose River Power Company to develop water in the Moose River in the Adirondacks.

All applications for licenses to develop hydro-electric power in the Niagara and St. Lawrence waters were denied, it being pointed out that the commission is opposed as a matter of policy to the granting of any rights to private interests to develop water power in these waters. Two applications affected by this decision are those of the Lower Niagara River Power & Water Supply Company and the Niagara Gorge Power Company. It appeared to the commission that the applicants for St. Lawrence waters, the Louisville Power Corporation and the St. Lawrence Transmission Company, had not perfected a complete set of plans upon which the application for the license could be finally heard. The commission postponed action therefore until December 29.

Great Lakes Meeting Opens Auspiciously

Enthusiasm Manifested at French Lick Gathering—Indiana Electric Light Association Precedes N. E. L. A. Division with Good One-Day Convention

THE fourth annual convention of the Great Lakes Geographic Division of the National Electric Light Association opened at French Lick, Ind., September 25. A large and eager group of executives and other representatives of the light and power companies were present. Marshall E. Sampsell's presidential address was principally a review of the year's work and accomplishments of this young N. E. L. A. section, which has already become one of the largest in numbers. While good relations with public authorities were the primary essential of success, Mr. Sampsell declared that it should be kept closely in mind that good relations between each individual customer and the company were the foundation stones of a permanent industrial structure. To bring this about he lauded the practice of selling securities to customers since it developed the idea that the utilities were home industries and not foreign, soulless corporations. The good work done through the medium of women employees was also stressed by President Sampsell.

Alluding to municipal ownership, the speaker suggested that a history committee be formed in each state to collect reliable information concerning municipal operation which would permit intelligent comparisons. This is now done in Illinois in co-operation with the Illinois Committee on Public Utility Information.

The rest of the session was devoted to problems of public relations, utility regulation and the work of women's committees. Busy sessions were also scheduled for Friday and Saturday, of which reports will be published in a later issue.

Indiana Electric Light Association Meeting

With Indiana utilities spending $50,000,000 this year for extensions, even greater gains will be made on the return of favorable business conditions than were recorded during the past five years, declared F. J. Haas in his presidential address before the sixteenth annual meeting of the Indiana Electric Light Association at French Lick on September 24, just prior to the meeting of the Great Lakes N. E. L. A. Division. Utility growth in Indiana has increased 80 per cent in output since 1917, 115 per cent in revenue and 116 per cent in salaries and wages. President Haas enthusiastically supported the customer-ownership plan as being a large factor in the upbuilding of good will. He strongly opposed the repeal of the state regulatory commission law, saying that he felt this body was trying earnestly to protect both the utilities and the public.

Arthur Scott, chairman of the public relations committee, presented an able and constructive report. Among other things he urged all utilities to formulate a well-thought-out plan of promoting public harmony through the agency of enlightened employees. Unless the rank and file of an organization is heart and soul in accord with the executive's spirit of promoting good will, he said, all the publicity in the world will not avail. Once the employee background is ready, then the public should be educated, but unless this background is prepared, future efforts will be futile.

RURAL SERVICE AGAIN

Dr. E. A. White called his address on the relation of agriculture to electricity "The Task Ahead." Thirty million people in the United States of America are now without the benefit of electricity, he asserted, and if their needs are not met, they will use their voting power to demand this service. Dr. White urged that utility executives become better acquainted with the farmer so that they can advise him wisely and furnish the right kind of service. They should not evade the issue by saying that this service cannot be given. It has been calculated that the six million farms in the United States represent an available power field of seventeen billion horsepower-hours a year. Even if only 25 per cent of this could be developed within the next ten years, the revenue would be well worth the investment. Dr. White also discussed the work of his committee in determining how farms could build up their load factor. He mentioned one farm of 700 acres using more than 200 kw.-hr. a month.

G. C. Neff, Madison, Wis., told how an electric grain drier had saved Wisconsin farmers from losing their grain crop, which had been cut while wet.

K. A. McIntyre of the Society for Electrical Development outlined the work of the better home-lighting contest and reported that 60 per cent of the territories served had been organized for spreading the campaign, the greatest since the war loan drives.

Resolutions of condolence were adopted by the association concerning the death of three past-presidents in the past year—C. C. Perry, T. A. Wynne and F. A. Bryan.

NEW OFFICERS

The newly elected officers are: President, T. N. Wynne, Indianapolis; vice-president, L. B. Andrus, Indianapolis; secretary and treasurer, Tom Donohue. The executive committee will comprise F. J. Haas of Evansville, Harry Reid of Indianapolis, Morse Dell Plain of Hammond, Marshall V. Robb of Clinton and Roy Thurman of Muncie.

Insull Interests Buy Three More Indiana Companies

Three more electric light and power utilities in Indiana have been purchased by the Insull interests of Chicago, and petitions have been filed with the Indiana Public Service Commission asking approval of the transaction. The utilities in question are the Knox & Sullivan County Light & Power Company and the Indiana Power Company, both of Vincennes, and the Consumers' Power Company of Princeton. Twenty or more Indiana cities and towns are served by the three compaines, and the total consideration paid for them is said to have been more than $10,000,000. Their common stock has hitherto been owned by the Utilities Power & Light Corporation of Chicago. The Interstate Public Service Company of Indianapolis, controlled by the Insull interests, asks permission to buy the Knox & Sullivan County Light & Power Company and the Indiana Power Company common stock, and it is announced that the Middle West Utilities Company, holding corporation for the Interstate common stock, will acquire the Consumers' Power Company, effect a reorganization and then turn it over to the Interstate.

Billions Put Into Utilities by Investment Bankers

Figures showing what the members of the Investment Bankers' Association of America have been doing in the placing of securities for the last three and one-half years were included in the address of the president, John W. Prentiss, at the association's annual convention, which was held in Cleveland this week. These figures showed new capital issues for domestic public utilities, not including railroads, for the first six months of 1924 amounting to $431,756,407. For the year 1923 the figures were $1,138,396,158; for 1922, $980,433,795, and for 1921, $671,085,220. These figures were exceeded by the investments in domestic industrial securities and, except in 1923, by state, county and municipal securities, but exceeded all other classes of investment approved by the association, including foreign government securities, farm loans and railroads.

The Delaware Compact

New York, New Jersey and Pennsylvania Ready to Draft Treaty with Federal Participation

THE federal representatives on the interstate committee which will prepare a tentative draft of a compact dealing with the utilization of the waters of the Delaware River probably will be Colonel John R. Slatterly, the district engineer at New York, and Colonel William Kelly, chief engineer of the Federal Power Commission. Colonel Slatterly will represent the War Department in matters pertaining to navigation and Colonel Kelly will advise on questions involving the use of the river for power purposes.

Pressure is being brought by New York officials with the idea of expediting the drafting of the treaty to which Pennsylvania, New York and New Jersey and the federal government will be parties. The interest of New York is due to the possibility that the next increment in the city's water supply may have to come from tributaries of the Delaware in New York State. Some are of the opinion that this work will have to be started within five years. For that reason it is felt that work should begin at the earliest possible time on the compact, particularly as some complications are in sight, chiefly those due to objections which New Jersey is expected to raise. Among the suggestions that have been made in connection with the proposed treaty is a provision that any state may divert flood waters to any extent desired, provided there shall be no interference with the low-water flow of the stream.

The New York representatives on the committee are Rudolph Reimer, Jefferson De Mont Thompson and George McDonald. J. Waldo Smith and Thaddeus Merriman are to serve as alternates. The New Jersey committee is headed by Colonel William A. Sterrat. The only other representative of the state who has been named is Fred C. Schneider. H. P. Critchlow and O. W. Hartwell have been designated as alternates for the New Jersey members. The Pennsylvania representatives are C. H. Miner, Robert Y. Stuart and Philip P. Wells; alternates, C. C. Ryder and F. H. Newell. When the federal representatives are formally designated an early meeting of the commission will be called.

Another Link in Interstate Interconnection

Joint announcement has just been made by the Niagara, Lockport & Ontaria Power Company and the Pennsylvania Electric Corporation that they will build at once a connecting line between their respective 110,000-volt transmission systems. This line will extend from Jamestown, N. Y., to Warren, Pa., a distance of about 30 miles, and will make possible the exchange of energy between the Niagara power district and the extensively interconnected lines of the Penn Public System, which reach from western Pennsylvania to Maryland. The connection of the Niagara and Pennsylvania systems, which involves no corporate, financial or managerial relationship, adds materially to the ramifications of the continuous stretch of transmission lines between the Atlantic Coast and the Great Lakes.

St. Lawrence Study Not to Be Delayed by Disputes

No delay in the study of the St. Lawrence River is expected to result from the controversy which has arisen with Canada as to diversion. Secretary of Commerce Hoover says that he believes the study will go forward on the matters which are not in dispute. While they are being worked out an understanding can be reached as to whether or not consideration is to be given the proportionate diversion going to each country at Niagara Falls. Canada would like to confine the discussion of diversion to that at Chicago.

Renewal in Canada of the suggestion that Canadian streams be diverted into the Great Lakes as a means of increasing their level has been noted with interest in this country. Some are of the opinion that Chicago well could afford to pay the cost of such diversion if the city thereby could be assured of authorization to use 10,000 sec.-ft. Objection to the plan has been raised in Chicago in the past on the ground that an amendment to the state constitution would be required before public funds could be expended in Canada. If for any reason it is not practicable to obtain an amendment to the constitution, it now is pointed out that the constitutional inhibition would not apply were the $10,000,000, the probable cost of the project, allowed Canada as payment for a claim.

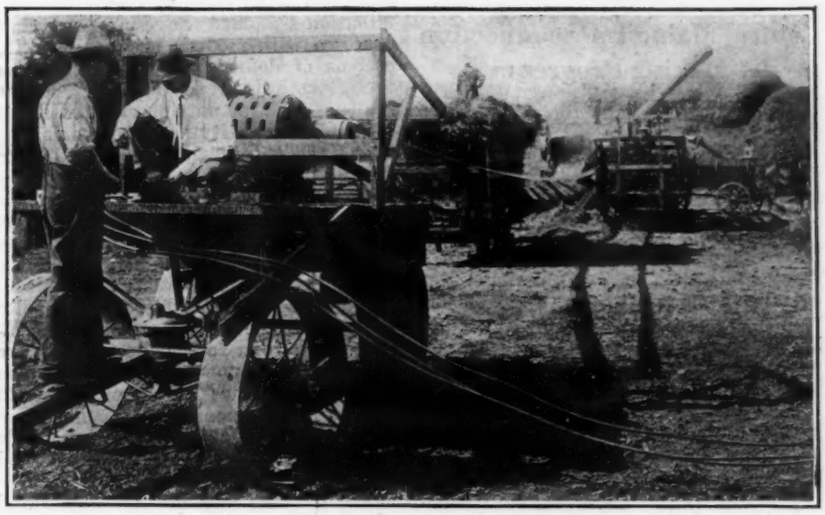
Further evidence that the St. Lawrence study will not be delayed by difficulties arising in connection with the diversion controversy is had in the fact that General Edgar Jadwin, Colonel William Kelly and Colonel George B. Pillsbury recently met in Detroit to perfect plans in pursuit of the American portion of the investigation.

Two New York Central-Station Companies Close Contract

The Associated Gas & Electric Company has closed a contract with the Adirondack Power & Light Corporation which will cover all the needs of the New York State Gas & Electric Corporation for the next decade, according to an announcement made in New York City the other day. Negotiations are under way for the extension of the transmission lines of the New York State corporation so that they can wholesale power in the territory not now covered.

In a letter to stockholders announcing the contract it is said that the outlook of the company is promising and that the policy will not be to acquire large highly organized and highly developed properties, because the prospects of substantial returns are greater through the combination and connection of smaller properties.

Using Electric Power to Thresh and to Dry Grain



THAT the application of electricity is feasible for threshing wheat and oats was successfully demonstrated this season on the farms of Eugene and De Loss Funk, near Bloomington, Ill., in an experiment made by the farmers co-operating with the Illinois Power & Light Corporation. Using a 40-hp. motor, 133 bushels of wheat were threshed per hour in a standard separator. The total cost of the motor, transformer and accessories is $1,300. The average traction engine costs $4,000 and a high-power tractor $2,000 and upward. The picture shows the motor in action during threshing time.

An electric grain-drying machine, said to be the first in successful operation in the United States, the product of E. R. Meacham of the Wisconsin State College of Agriculture, has been in operation on a farm near Ripon, Wis., for about two months, according to Mr. Meacham. Tests are being made to determine the practicability of drying grain in this way, as rain often delays the field-drying process. Electric blowers are placed beneath the stalks; the grain is dried out and then is ready for the threshing machine.

Industrial Mission to Mexico Returns Well Satisfied

The American Industrial Mission to Mexico returned to the United States this week after two weeks' study of business conditions in the republic to the south. It will be remembered that this mission was organized by American industrial leaders in response to an invitation from Mayor Raya of Mexico City and with the sanction of the Department of State at Washington. E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, was chairman of the organization committee, on which the International General Electric Company and other electric manufacturing companies were represented.

W. W. Nichols, president of the American Manufacturers' Export Association, who headed the mission, speaks optimistically of the friendly relations established with the industrial and political leaders of Mexico and warmly praises President Obregon, who spent an entire day with the party, visiting plants, and extended to it every hospitality.

It is the opinion of the members of the mission that affairs in Mexico are growing more stable and will shortly warrant the resumption of trade relations on the part of American manufacturers. It is also believed by the party that Mexico will in time get the loan it is seeking from American banking institutions.

Record time was made on the journey to and from Mexico City, the trip each way from and to New York consuming only four days.

Central Maine Interconnection Making Progress

Excellent progress is being made upon a number of important interconnections and transmission-line extensions of the Central Maine Power Company, all of which are planned either to increase the reliability of service in occupied territory or to furnish energy to communities hitherto supplied on a small scale. A No. 4/0 aluminum line 3½ miles long and to operate at 33,000 volts will be completed about November 15 between Rice Rips, Oakland station and Fort Halifax, near Waterville. This will insure the supply of energy from the Messalonskee hydro-electric plants to the system even if trouble occurs on the Skowhegan-Fort Halifax trunk line. A 9-mile, 33,000-volt line of three-phase No. 4/0 copper on wooden poles was finished in August to increase the interconnection with the Milo Light & Power Company, with a new substation at Dover, Me.

A duplicate 33,000-volt No. 4/0 aluminum line from Union to Rockland is to be finished about Oct. 20, this being 13 miles long and designed to meet the demands of a growing load in that district. About October 15 an interconnection with the recently purchased Lincoln County Power & Light Company will be completed. This will be an 8½-mile, 33,000-volt line of No. 2 aluminum with steel towers at river crossings and an additional substation at Damariscotta Mills. A 2,000-kw. interconnection with the central-station company at Portland is now in use.

"Code of Lighting School Buildings" Now a Standard

With the approval of the "Code of Lighting School Buildings" as an American standard by the American Engineering Standards Committee, a demand for definite, detailed and up-to-date specifications for lighting school buildings, on the part of the architects of school buildings, school superintendents and school boards and regulatory bodies has been met. The present code is the result of a thorough revision of the code prepared and issued in 1918 by the Illuminating Engineering Society. A number of changes and improvements in lighting practice itself since the 1918 code was issued have made necessary its revision to conform with the best modern practice.

Considerable interest was manifested in the original code, as is evidenced by the fact that it was adopted shortly after its publication by the New York State Department of Education as a guide in planning the artificial lighting of school buildings in that state. The Industrial Commission of Wisconsin used it as a basis for the preparation of the Wisconsin School Lighting Code, effective 1921. Provisions of the code have been incorporated in building codes in several states and municipalities and have led to marked improvements in school lighting throughout the country.

The new code differs from the old chiefly in being more specific. The illumination standards have been raised to conform with modern practice; specifications of definite requirements under the glare rule have been included; a limiting ratio of maximum intensity to minimum intensity in classrooms has been included in the rule relating to distribution of artificial light; reflection factors have been specified in the rule relating to color and finish of interior; the rule relating to exit and emergency lighting has been amplified, and a rule relating to the illumination of blackboards has been added. The rules themselves are clear and concise, occupying less than four pages. They are followed by a non-technical discussion of the importance of compliance with them and directions for carrying them out. These are accompanied by simple diagrams, illustrations of good and bad lighting, etc.

The present code was developed and adopted by unanimous action of a large and representative sectional committee made up of official representatives of the technical, educational and industrial organizations concerned, acting under the leadership of the Illuminating Engineering Society and the American Institute of Architects. The organizations represented included the American Institute of Electrical Engineers, the National Electric Light Association, the Illuminating Engineering Society, the National Safety Council, the American Institute of Architects, the American Gas Association and other interested bodies of various kinds.

Briefer News

North Carolina Municipal Plant Gives Up.—The Carolina Power Company has taken over the municipal plant at Ashboro, N. C., and established an office in that town.

Wisconsin Hydro Plant to Be Doubled.—The Northern Wisconsin Hydro-Electric Power Company announces that it will double the capacity of its water-power plant at Orienta Falls next year. The company has just expended $160,000 in additions and improvements and has constructed 60 miles of 22,000-volt transmission lines interconnecting Bayfield, Cornucopia, Herbster, Port Wing and Iron River.

Arkansas-Missouri Power Company Acquires Two Additional Properties.—The Arkansas-Missouri Power Company, controlled by A. E. Fitkin & Company, New York, has bought the interest of Ben F. Eicholtz in the Campbell Electric Company and the Clarkton-Dunklin company, which will now be operated from Kennett, Mo. The purchasing company serves several towns in Arkansas and Kennett, Caruthersville and Hayti in Missouri.

Interstate Public Service Company May Build Large Plant on St. Joseph River.—A large hydro-electric plant on the St. Joseph River near Bristol, Ind., is in contemplation by the Interstate Public Service Company, in addition to its projected plants on the Elkhart. The plans for the Bristol plant are said to be for a capacity larger than the combined rating of the other plants existing or designed for the Goshen district.

Municipal Electricians to Meet at Augusta, Ga.—Arrangements have been completed for the twenty-ninth annual convention of the International Association of Municipal Electricians, which will be held in the Partridge Inn, Augusta, Ga., October 14 to 17. A program of papers on fire alarm and police telegraph, electrical inspection, traffic signaling and all branches of municipal electrical work has been prepared.

West Penn Company Acquires West Virginia Utility.—The West Penn Company, a subsidiary of the American Water Works & Electric Company has acquired the properties of the Buckhannon Light & Water Company, of Buckhannon, W. Va. This property will eventually be tied in to the West Penn system by a high-voltage transmission line. Buckhannon is the county seat of Upshur County and has a population of about five thousand.

Idaho Reclamation Project Will Distribute Power Over Central-Station Lines.—Work is starting on a hydro-electric power plant to be built at the

Black Canyon Dam, Idaho, at a cost of $450,000, for the Gem Irrigation District. The power generated will be utilized by the farmers in the district for pumping water and will be given for distribution to the Idaho Power Company through its Emmett substation in exchange for power delivered to the Gem Irrigation District on Snake River.

Electrical Manufacturers' Council Elects Officers.—At the annual meeting of the Electrical Manufacturers' Council at the Hotel Cleveland, Cleveland, on September 19, officers for the ensuing year were elected as follows: Chairman, Clarence L. Collens, Reliance Electric & Engineering Company, Cleveland; vice-chairman, D. R. Bullen, General Electric Company, Schenectady, N. Y.; treasurer, J. W. Perry, Johns-Manville, Inc., New York City.

Milwaukee Engineers Have Twentieth Anniversary.—On Wednesday evening, September 17, the Engineers' Society of Milwaukee celebrated its twentieth anniversary. Seven of the twenty past-presidents participated, each reviewing his own administration. The society, which includes electrical, mechanical, civil and refrigerating engineers, now has an active membership of 300, besides 750 affiliated members. It has been an important factor in civic affairs.

Detroit Railway Closes Its Four Power Houses and Purchases All Energy. — The Detroit United Lines early in 1923 entered into an agreement with the Consumers Power Company and the Detroit Edison Company for the purchase of all power necessary to operate their 600 miles of city and interurban lines. In August of this year the last of the railway company's power houses was closed down. The four power houses at Farmington, Monroe, New Baltimore and Rochester, Mich., have been replaced by nineteen 1,000-kw. full-automatic substations.

Safety Congress to Be Held at Louisville.—The thirteenth annual congress of the National Safety Council will be held in Louisville on September 29-October 3. The Public Utilities Section will convene on Tuesday, September 30, at the Seelbach Hotel. On its program is an address on "Selection and Safe Installation of Electric Appliances" by C. E. Greenwood, superintendent appliance department Edison Electric Illuminating Company of Boston. At a joint meeting with the Electric Railway Section on the following day Homer Niesz, manager industrial relations Commonwealth Edison Company, Chicago, will speak on "Instruction in and Observance of Safety Rules in Station and Substation Operation." Secretary Hoover will make an address at the banquet on Thursday evening, October 2.

First Radio World's Fair.—The first Radio World's Fair opened in Madison Square Garden and the Sixty-ninth Regiment Armory, New York City, on September 22 and is continuing until Sunday night, September 28. There are exhibits by 164 American companies and twenty-five or more radio manufacturers of Europe and Japan. These exhibits occupy 126,000 sq.ft. of floor space, completely filling both huge buildings, and the attendance has been in the hundreds of thousands. Programs were broadcasted every afternoon and evening.

Continental Gas & Electric Buys Lincoln Traction.—The Continental Gas & Electric Corporation has purchased control of the Lincoln (Neb.) Traction Company, subject to the approval of the Nebraska State Railway Commission, President Rufus E. Lee of the purchasing syndicate announces. The Lincoln Traction Company sells light and power as well as operating the Lincoln street railway. The Continental bought the Lincoln Gas & Electric Light Company from the Doherty interests two years ago. It has since enlarged and rebuilt the plant and is now building 60 miles of 66,000-volt transmission line, the first in Nebraska.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 5 issue, page 50, for latest list.]

Safety Congress, National Safety Council — Hotels Brown and Seelbach, Louisville, September 29-October 3.

Association of Electragists International—West Baden Springs, Ind. Sept. 29-Oct. 4. L. W. Davis, 15 West 37th St., New York.

American Electrochemical Society — Hotel Fuller, Detroit, Oct. 2-4. Colin G. Fink, Columbia University, New York.

American Electric Railway Association—Atlantic City, N. J., Oct. 6-10. J. W. Welsh, 8 West 40th St., New York.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 6-7. C. H. B. Chapin, Grand Central Terminal, New York.

American Institute of Electrical Engineers—Pacific Coast convention, Pasadena, Cal., Oct. 13-17. F. L. Hutchinson, 33 West 39th St., New York.

American Institute of Mining and Metallurgical Engineers—Birmingham, Oct. 13-15. F. F. Sharpless, 29 West 39th St., New York.

International Association of Municipal Electricians—Partridge Inn, Atlanta, Oct. 14-17. W. R. Arbuckle, Bayonne, N. J.

Electric Power Club—Greenbriar Hotel, White Sulphur Springs, W. Va., Oct. 20-23. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

American Society of Civil Engineers —Hotel Tuller, Detroit, Oct. 22-25. C. E. Beam, 29 West 39th St., New York.

Kansas Public Service Association—Broadview Hotel, Emporia, Kan., Oct. 24-25. R. T. Smalley, Kansas Electric Power Co., Emporia.

Illuminating Engineering Society, Briarcliff Manor, N. Y., Oct. 27-31. N. D. Macdonald, 29 West 39th St., New York.

National Association of Railway and Utilities Commissioners — Phoenix, Ariz., Nov. 11-14. James B. Walker, New York Transit Commission, New York.

West Virginia Public Utilities Association—Charleston, W. Va., Nov. 14-15. Bliss McCrum, secretary.

Electrical Credit Association (Middle and Atlantic States)—Philadelphia, Nov. 14. F. P. Rose, Marquette Bldg., Chicago.

Electrical Supply Jobbers' Association —Hotel Cleveland, Cleveland, Nov. 19-21. Franklin Overbagh, 411 South Clinton Street, Chicago.

Management Week to Be Observed in October.—Sixty-five cities will hold meetings this year in observance of "management week," which is to span the dates from October 20 to October 25. The activities are sponsored by five national societies—the American Management Association, the American Society of Mechanical Engineers, the National Association of Cost Accountants, the Society of Industrial Engineers and the Taylor Society. Information concerning the work and program will be given by Ernest Hartford, Engineering Societies Building, New York.

Expansion in Tennessee.—The Tennessee Electric Power Company has received authority to purchase the transmission lines of the Davidson Light & Power Company and the distribution systems in several small towns. With this purchase the Tennessee Electric Power Company owns all the lines between Nashville and Springfield. By bridging a short gap between Springfield and Adams it could connect with the Kentucky-Tennessee Light & Power Company's lines. The latter company has purchased a number of municipal plants in west Tennessee and is preparing to install a large distribution system.

White Water Creek Is Finally Harnessed.—After efforts extending over two years, the White Water Power Company's dam and power plant at White Water Creek, 5 miles from Montezuma, Ga., have been completed, and it is expected that on October 1 the plant will begin to furnish light and power to Montezuma, Oglethorpe, Marshallville, Reynolds and other places in the vicinity. The creek is swift and turbulent and on several occasions its waters had broken through the partly completed dam and plant, sweeping everything before them. It is the largest hydro-electric project in Macon County.

Duquesne Light Company's New Substations.—A million-dollar plant known as the Giant substation has just been opened at Second Avenue and Ross Street, Pittsburgh, by the Duquesne Light Company. Its opening is the first step in a program which will entail the expenditure of nearly $10,000,000 to provide better service in the downtown district. The station is the first of three, the other two of which will be the Stanwix substation in the Duquesne Building, and the Thirteenth Street substation. These three substations will be rated at about 40,000 hp. and will be fed from the generating stations at Brunot Island and Colfax. Current will be stepped down to 11,000 volts and 4,000 volts.

Progress of Rate Case of Potomac Electric Power Company.—Accountants of the Public Utilities Commission of the District of Columbia have finished their study of the earnings of the Potomac Electric Power Company, which shows that for the year ended August 1 the power company received a return of 8.9 per cent on the commission's fair value of the property. The commission

will decide after getting the report of the accountants whether a rate hearing should be held at this time. The power company will continue to collect the 10-cent light rate and impound the difference between that amount and the rate approved by the commission until the courts settle the valuation dispute between the company and the commission. The present rate fixed by the commission for household electricity is 7.6 cents per kilowatt-hour.

Tidal Power Project Again Discussed in Great Britain.—The British government has decided to proceed at once with preliminary investigations to ascertain the feasibility of using the tidal power of the River Severn for the production of electrical energy by the erection of a dam across the river. The Department of Scientific and Industrial Research, which has been intrusted with the work, has appointed a committee of experts to direct the investigations, the first stage of which will be devoted to the possibility of finding satisfactory foundations for a dam and preliminary measurements of the flow of water at the different stages of the tide.

Ontario Municipal Electrical Association Opposes International Development of St. Lawrence.—The executive of the Ontario Municipal Electrical Association has gone on record as being strongly opposed to any move to develop St. Lawrence power through a joint international commission. Condemning the suggestion of the Canadian Deep Waterways Association that the deepening of the St. Lawrence should be paid for from the proceeds of the sale of power to the province, President C. A. Maguire of the Ontario Municipal Electrical Association said that Ontario was "going to stand on its rights to control the water and have the people of Ontario develop power through its provincial Hydro-Electric Commission."

Rapid Progress with New Hydro-Electric Plant on Ottawa River.—Officials of the Ottawa (Canada) electric companies report extraordinary progress on the plant being built at Calumet Falls, Bryson, Quebec, on the Ottawa River. Two-thirds of the permanent dam has been completed, and excellent progress is being made with the power house. It is expected that by January 1 the first unit will be ready and power delivered in Ottawa. The generators will be supplied by the Canadian Westinghouse Company of Hamilton, Ontario. The Ottawa Light, Heat & Power Company and the Ottawa Electric Railway Company will be among the first companies to receive power from the new plant, which will develop 75,000 hp.

Oklahoma Electrical Men Have Successful Conference.—Great interest was shown in the sessions of the annual conference of the seventh and ninth districts of the electrical division of the Oklahoma Utilities Association, held at Lawton, Okla., on September 18. The building of good will by electric utility companies was the keynote of the program, the discussion being participated in by officers of public utilities, representatives of municipalities and officers of the association. The members of the conference attended the luncheon of the Lawton Kiwanis Club, where Congressman Elmer Thomas of Lawton, E. F. McKay of the Oklahoma Utilities Association and Earl R. Ernsberger of Oklahoma City, president of the Southwestern Light & Power Company, made the principal addresses. The election of officers resulted in the choice of R. W. McClure of Duncan as district chairman and C. S. Wages of Cement as district secretary. Frederick was chosen as the meeting place for the 1925 conference of the districts.

Dug Up from an Eight-Year Grave, Motor Is Found Little Injured.—In 1916 a well on a ranch at Corona, Cal., caved in and buried a General Electric, Sprague type S, six-pole, 40-hp., 2,200-volt vertical motor. Recently the motor was removed from the well, cleaned up, thoroughly dried and tested with 4,400 volts to ground, and the insulation was found to be good. External leads were replaced, some end connections insulated and the windings varnished and baked. The oil piping to the lower bearing had rusted out and was replaced. The two babbitt bearings were in good condition, but the upper ball bearing, being badly rusted, had to be replaced. A coat of paint then put the motor in first-class condition, and it was ready for service again.

Electrochemists Have Full Program for Detroit Meeting. — Besides the round-table discussion of electric furnace cast iron already noted in these columns, the American Electrochemical Society will at its Detroit convention on Thursday to Saturday of next week hold a similar discussion on control methods in electrodeposition under the lead of O. P. Watts and William Blum. There will be, too, symposiums on corrosion (B. D. Saklatwalla, chairman), industrial electric heating (Prof. C. F. Hirschfeld, chairman), and electric furnace refractories (Dr. M. L. Hartmann, chairman). Among other features of the convention will be a general meeting on Friday evening in the auditorium of the Board of Commerce, when Alex Dow, president of the Detroit Edison Company, will make an address on "Central-Station Design and Superpower."

Litigation Over Wateree (S. C.) Power Plant.—Suit and countersuit growing out of the construction of the power plant at Wateree, S. C., and involving approximately $2,000,000, have been instituted by the Wateree Power Company and the Southern Power Company on the one side and the Hardaway Construction Company on the other. The conflicting evidence is being heard in Charlotte, N. C., by a referee, and the hearing may last for three or four months. The power companies claim that the contracting firm did not comply with the contract in specifications and as to time of completion and asks damages amounting to approximately $1,000,000 on various counts. The construction company, on the other hand, asks for damages in approximately the same amount, setting forth that freshets hindered and damaged the work being done and that war conditions caused difficulty in obtaining labor. The contract was let in the fall of 1916, and the plant was not completed until 1920.

Boston Sewage Pumps to Be Motorized.—Authority has been given by the Mayor of Boston to the Commissioner of Public Works to enter into a contract with the Edison Electric Illuminating Company of Boston for motor service at the Calf Pasture sewage-pumping station, the minimum cost of the service to be $25,000 a year. Two high-speed steam turbines geared to four pumps will be removed, and in their places four 275-hp., 440-volt, three-phase motors will be installed by the city, each to drive one pump. At this writing the motor contract has not been signed, and it has not been determined whether to use induction or synchronous units. The new installation will be operated in conjunction with engine-driven pumps which have long carried the base load at this station and will be especially useful during storm periods and as a reserve in case of trouble with the fuel-oil boiler plant, piping and engines.

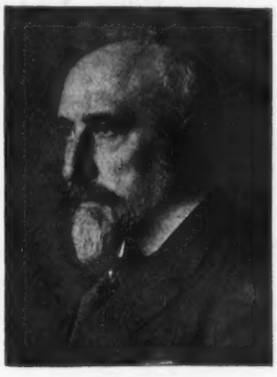
Present Status of Municipal Plants in Wisconsin. — Up-to-date data collected by statisticians of the Wisconsin Railroad Commission show that Wisconsin has seven municipally owned electric plants which generate all their energy, seventy-five municipalities which buy all their energy from privately owned plants and fifteen which generate a part and buy a part. Municipal plants generate less than 3 per cent of the total output of generating plants in the state. In the past five years nineteen municipal plants have been sold to private companies. In 1924 only one election involving the question of municipal ownership has been held. This was at Chippewa Falls, where the vote was about two to one in favor of the retention of private ownership. Five cities in 1924 started to purchase energy from private companies. They are Plymouth, Black River Falls, Port Washington, Bayfield and Muscoda.

Northwestern University to Have Course in Public Utility Economics and Management.—Northwestern University is establishing in its School of Commerce a collegiate curriculum covering public utilities and their management. The course will include public utility operation, accounting, finance and law and also the public relations of utilities. These subjects will be taught by men who are prominent in the public utility field and by nationally known educators. There will be two distinct bodies of students—the regular students, who will take a four-year course, and the part-time students, who will be mainly present-day employees of public utility companies and will attend the Northwestern University's School of Commerce in Chicago three evenings a week, covering a four-year period.

Men of the Industry

Dr. Koettgen Visits America

Dr. Carl Koettgen, director general of the Siemens-Schuckertwerke and president of the Reichskuratorium für Wirtschaftlichkeit, has come to America for a two months' visit with the purpose of getting better acquainted with the leading American industries and of studying economic and general conditions in the United States. He is accompanied by the works manager of the Siemens-Schuckertwerke, Dr. F. Ludwig, and Professor Schilling, who



CARL KOETTGEN

is acting secretary of the Reichskuratorium für Wirtschaftlichkeit.

A graduate mechanical engineer, Dr. Koettgen joined the firm of Siemens & Halske in Berlin after the completion of his studies and soon became manager of their industrial power department. From 1894 to 1907 he developed the use of electric power for all industrial purposes, especially for mines and steel works. At the end of 1907 he took over the management of Siemens Brothers' dynamo works in London. After the war he returned to Germany, took over the management of all the factories of the Siemens-Schuckertwerke and soon after the general management of this firm. Today, in addition to being the head executive of this concern, Dr. Koettgen is also director of the Gelsenkirchener Bergwerks und Huetten A. G. and of the Deutsch-Luxemburgische Bergwerks und Huetten A. G.

E. L. Milliken, assistant manager of the Blackstone Valley Gas & Electric Company, has resigned in order to enter private business. Mr. Milliken is one of the best known of the younger central-station executives in New England and has been conspicuously sucessful for his work in the field of public relations. He has been an active worker in the National Electric Light Association and as chairman of the Public Relations Section of the New England Division and has been a valued contributor to the ELECTRICAL WORLD of articles on commercial and customer problems.

John H. Trumbull, president of the Trumbull Electric Manufacturing Company, Plainville, Conn., and a member of the board of governors of the Associated Manufacturers of Electrical Supplies, has been nominated as Republican candidate for Lieutenant-Governor of Connecticut. Mr. Trumbull, a state senator at the present time, has served as president of the State Senate and as Acting Governor in the absence of the Governor.

Captain William McGregor, vice-president of the Blackstone Valley Gas & Electric Company, Pawtucket, R. I., was recently presented with a sterling-silver plaque to commemorate the completion of forty years of community service. The presentation address was made by ex-Governor Higgins of Rhode Island, who paid a high tribute to Mr. McGregor's work in the field of public relations and in behalf of the common welfare.

G. M. Gadsby New President of Pennsylvania Association

G. M. Gadsby, vice-president of the West Penn Power Company and other power companies in the West Penn System, was elected president of the Pennsylvania Electric Association at the convention held recently in Bedford Springs. Mr. Gadsby's first public utility work was with the city of Marietta, Ohio, when in 1906 he became chemist at the filtration plant. Upon graduation from the Massachusetts Institute of Technology he entered the employ of the American Water Works & Guarantee Company as sanitary chemist, but in the spring of 1910 he was appointed superintendent of the Warren Water Company and since that time he has been engaged in commercial and executive public utility work. He remained in the employ of the American Water Works & Guarantee Company and its successor company, the American Water Works & Electric Company, Inc., until October, 1917, at which time he went to Pittsburgh as assistant to the president of the companies composing the West Penn System. In August, 1918, he was made vice-president of the West Penn Power Company and other power companies in the West Penn System, having charge of the commercial work of the companies. He has been active in the affairs of the Pennsylvania Electric Association since 1918, having organized the first commercial section and served as chairman for three years. He also acted for two years as chairman of the special power survey committee, representing the association in work with the Giant Power survey board and work in conjunction therewith by the Public Service Commission.

L. S. Streng Heads Operations Department in Louisville

Louis S. Streng, since 1913 associated with the Louisville (Ky.) Gas & Electric Company, was elected vice-president in charge of operations at the meeting of the board of directors held September 18. Mr. Streng has been a vice-president of the company since last summer and had previously filled the position of chief engineer and general superintendent. He was graduated from the Massachusetts Institute of Technology in 1898 and the following year became assistant chief engineer of the Public Service Corporation of New Jersey, where he remained until 1906, when he became chief engineer of the Kentucky Electric Company. Upon the merger of that organization with the present company

L. S. STRENG

he became chief engineer and general superintendent of the resulting organization.

A. Rogers, formerly a member of the accounting department of the Michigan Public Service Company at Cheboygan, has been promoted to the position of new business manager, succeeding I. Corlett.

George C. Mathews, in charge of the statistical division of the Wisconsin Railroad Commission, has been appointed professor of public utilities at Northwestern University. Mr. Mathews, however, will remain with the commission, devoting his time to classes one day a week in the problems of operation and management of public utilities. He is a graduate of the University of Wisconsin and has been with the Railroad Commission twelve years.

Obituary

Charles C. Perry, president of the Indianapolis Light & Heat Company, died September 23, following an illness of six weeks.

Frank F. Lester, chief electrical engineer for the Sibley, Lindsay & Curr Company, Rochester, N. Y., for the past twenty years, died at his home in that city, September 15, following a short illness. Mr. Lester was fifty-four years of age.

Financial and Corporate

Utilities Rise Briskly

American Power & Light Jumps 100 Points, Selling Up to $500 a Share

FOR several weeks a stronger tone has been making its appearance in the unlisted market for utilities, and also in the listed market, but during the past week what was quiet strength turned into a sharp advance. American Power & Light Company's common shares made a spectacular rise of 100 points in a week, and the new stock, which represents the old issue divided into units of tenths, rose nine or ten points. It is another instance going to show that, given a sound foundation, stocks very often find a better market and a broader one after a split-up than before. Purchases of old American Power & Light shares nowadays are made, of course, simply to get new units. The shares touched 500 as compared with 198 earlier in 1924.

American Gas & Electric stock likewise has become a greater favorite among utility investors, and this issue, which sold at 48 earlier in the year, has moved to a level about twice that low price. The increased interest in the utilities comes in part from easier money conditions, of course, but it comes in the main from the fact that power and light companies are among the few types of enterprise that have been able to grow despite the general depression in many sections. The demands for service are on the increase, and that cannot be said for all forms of industry.

Commonwealth Power Corporation shares settled down to about par after going "ex-rights," but soon recovered and closed the week approximately six points higher. This corporation's rights are selling freely in the market, but the warrants are difficult to obtain. Among the more important gains for the week were: American Light & Traction, nine points; Carolina Power & Light, seven points; East Penn Electric, fourteen points; Lehigh Power Securities, seven points; United Light & Improvement, twelve points. American Water Works & Electric had another smart rally on the New York Stock Exchange market, and North American Company's common shares rose to 35 at one time.

New Properties Acquired by Connecticut Syndicate

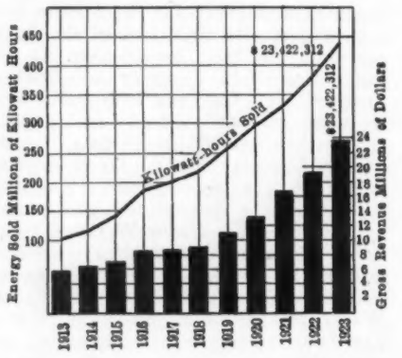
The New Milford Electric Light Company of New Milford, Conn., has been purchased by the Connecticut Electric Syndicate, which is composed of the majority interests of the Connecticut Light & Power Company. The New Milford Electric Light Company was capitalized at $150,000 and had a funded debt of $100,000. The last report to the Connecticut Public Utilities Commission showed inventories amounting to $290,000 and assets of $328,000. The company served New Milford, Bridgewater and Washington. Although owning a generating plant, it bought most of its power from the Connecticut Light & Power Company, being conveniently situated with reference to the company's main power lines and the new plant at Stevenson. The New Milford company has reorganized with the following officers: President, Irvin W. Day; secretary and treasurer, Charles L. Campbell; directors, the officers and Verton P. Staub. The Connecticut Electric Syndicate has also acquired the charter and business of the Woodbury (Conn.) Electric Company, which was organized about twenty-five years ago and in recent years has been buying its power from the Connecticut Light & Power Company. The community numbers only about 1,500 people, and feeling prevailed among the stockholders that public necessity made the change of ownership advisable. The company has reorganized with the following officers: President, Irvin W. Day; secretary and treasurer, Charles L. Campbell; directors, the officers and A. J. Campbell, T. H. Blaikie, E. S. Boyd and A. W. Mitchell.

Brooklyn Edison Company's Securities

This Conservatively Managed Metropolitan Utility, Which Does All of the Brooklyn Business, Has an Unusual Dividend Record

BY PAUL WILLARD GARRETT

THE Brooklyn Edison Company, Inc., is one of the few great power and light companies whose stock is listed on the New York Stock Exchange. This company has no preferred shares and has not conducted any customer-ownership campaign in the sense that one ordinarily uses that term, but it nevertheless has achieved pretty much the same benefits through a broad distribution of its common shares. In 1913 it had only 766 stockholders; now it has around 8,000, of whom a large proportion live in Brooklyn. Since the company operates in Greater New York and has undertaken no preferred-stock sales to customers, the listing of the common stock on the Exchange has aided in popularizing the issue among the Brooklyn people.



GROSS REVENUE OF THE BROOKLYN EDISON COMPANY HAS SHOWN STEADY YEARLY GAINS FOR THE PAST TWENTY YEARS

One way to tell how good Brooklyn Edison Company bonds are is to test the quality of the stock which comes after the bonds. The fact that Brooklyn Edison common has risen only about ten points so far in 1924, or to about 117, while some other power and light stocks have risen fifty points or even a hundred, is no sign that the issue is lacking in quality. The fact of the matter is that, although many of the equity issues only now are going through their seasoning process, Brooklyn Edison common has been seasoned for some time.

SOUND FINANCIAL STRUCTURE

Fixed capital of the company on December 31, 1923, stood at $83,710,139. Against this on that date there were outstanding only $30,746,100 in bonds and $43,704,300 in capital stock. It does not take an expert in utility affairs to see that this gives a wide margin in values represented for Brooklyn Edison bondholders. In the general investment world mortgages which represent up to 60 per cent of a property's value are considered very conservative, but here is a case where the mortgage covers only 37 per cent of its property. The relatively moderate issue of bonds leaves a large margin of safety for bondholders, and the conservative proportion of bonds to stock is all the more significant in that the organization is an operating rather than a holding company. It is partly a result of the sound financial structure that the Brooklyn Edison Company has been able for twenty years to show net earnings on the average more than enough to cover twice over all the fixed charges.

The Brooklyn Edison Company enjoys a virtual monopoly of the Brooklyn business, but its services are confined to that metropolitan district, a thing that makes its statistics of growth all the more impressive. Gross revenues have increased every year for twenty years, or from $2,597,904 in 1905 to $23,422,312 in 1923. In the same period, and also by steady yearly gains, the kilowatt-hour output rose from 30,655,832 to 444,996,313. Such a growth in business is the more impressive in that it has been achieved in a steady fashion.

This great gain in business naturally was accompanied by increases in the company's capital issues. However, the volume of business has grown faster

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par value of stocks is $100.)

Companies	Bid Price Saturday, Sept. 20	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	97	94	97½
Appalachian Power, 7 per cent	89	85½	90
Arkansas Light & Power 7 per cent	90	81	93
Asheville Power & Light 7 per cent	96	96	99
Carolina Power & Light 7 per cent	98	95½	100
Central Illinois Public Service 6 per cent	84	84	87
Colorado Power 7 per cent	93	90	97
Connecticut Light & Power 7 per cent	99	99	102
Consumers' Power 6 per cent	90	85	93
Dayton Power & Light 6 per cent	84	84	90
Duquesne Light 7 per cent	a107½	102	108
Eastern Texas Electric 6 per cent	95	81	95
Empire District Electric 6 per cent	73	70	78
Fort Worth Power & Light 7 per cent	97	97	100
Great Western Power 7 per cent	99	96	99
Illinois Northern Utilities 6 per cent	82	82	87
Illinois Power & Light 7 per cent	92½	84	95
Kansas Gas & Electric 7 per cent	93	92	97
Long Island Lighting 7 per cent	97½	95	98
Minnesota Power & Light 6 per cent	89	78	89
Mississippi River Power 6 per cent	87	80	90
Nebraska Power 7 per cent	95	89	99
Niagara Falls Power 7 per cent—25	a 28½	27	29
Niagara, Lockport & Ont. Power 7 per cent	101	99½	104½
Northern States Power 7 per cent	94	91	97
Ohio Public Service 7 per cent	93	86	96
Pacific Gas & Electric 6 per cent	90	85½	92½
Penn-Ohio Power & Light 7 per cent	91	84	96½
Pennsylvania Power & Light $7—no par	98	93	99
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	a 38½	29½	39½
Southern California Edison 8 per cent	115	112	119
Tennessee Electric Power, 6 per cent	78	71	81
Texas Power & Light 7 per cent	95	95	96½
Utah Power & Light 7 per cent	95	94	96½
Western States Gas & Electric 7 per cent	80	78	85
Yadkin River Power, 7 per cent	97	94	97
Holding Companies			
American Gas & Electric 6 per cent—50	44½	41½	46
American Light & Traction	92	91	94½
American Power & Light 6 per cent	89	84	91
American Public Service 7 per cent	80	84	92
American Public Utilities 7 per cent	82	73	88
American Water Works & Electric 6 per cent	a 90	66	99
Carolina Power & Light 7 per cent	99½	95½	99½
Central Indiana Power 7 per cent	86	80	90
Cities Service 6 per cent	74	67	75
Commonwealth Power	a 77	72	82
Consolidated Gas 6 per cent—50	58	51	59½
Continental Gas & Electric 7 per cent	85	69	90
Electric Bond & Share 6 per cent	100½	96½	103
General Gas & Electric—$8—no par	102	96	103½
Middle West Utilities 6 per cent	88	80	90
National Power & Light—$7—no par	92	84	96½
North American 6 per cent—50	a 47½	43½	50½
Northern Ohio Electric	a 24	16	34
Public Service Corp. of N. J. 7 per cent	99½	96½	100½
Public Service Corp. of N. J. 8 per cent	a109½	99½	110
Standard Gas & Electric 8 per cent—50	48½	46½	49½
‡United Gas Improvement—50	57½	55½	58
United Light & Power—$6.50—no par	81	75½	81
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	32	22½	34
Appalachian Power—no par	75	66⅔	93
Arkansas Light & Power	60	22	63
Brooklyn Edison	a 116½	107½	117½
Buffalo General Electric	149	118	155
Carolina Power & Light	230	82½	245
Colorado Power	33	21	35
Commonwealth Edison	132	126	135
§Consolidated Gas, Electric Light & Power	a 123½	113	135½
Dayton Power & Light	133	70	133
Detroit Edison	a 108½	102½	110½
|| Edison Electric Illuminating of Boston	a 182	163½	190
*Kentucky Hydro-Electric	85½	84	87½
Long Island Lighting	175	100	195
Mississippi River Power	31½	18½	32½
Montana Power	a 68	61½	71
Niagara Falls Power—no par	42	42	48
Niagara, Lockport & Ontario Power—no par	53	45	59
Northern Ohio Electric—no par	7	5	16
Northern States Power	102	92	106
North Texas Electric	61	58	84
Pacific Gas & Electric	a 98	90½	98
‡Penn Central Light & Power—no par	59½	57	60
Pennsylvania Water & Power	107	98½	110
‡Philadelphia Electric—25	a 38½	29	39½
Public Service Co. of Northern Illinois	97	97	104
Puget Sound Power & Light	55	43½	61½
Southern California Edison	98	95	106
Tampa Electric	a162	134	162
Tennessee Electric Power—no par	39	20	41½
Virginia Power	60	16	70
Virginia Railway & Power	a 68½	36	72½
West Penn. Co.	a 92	47½	98

Companies			Bid Price Saturday, Sept. 20	Low 1924	High 1924
Holding Companies					
‡American Electric Power—50			62	22½	62½
American Gas & Electric—no par			97	43½	97
American Light & Traction			135	115	140½
American Power & Light	(old)		440	200	455
	(new)		48	34½	48
American Public Utilities			84	35	97
American Water Works & Electric			a 120	40	121
Carolina Power & Light—no par			238	103	240
Cities Service			143	140	155
Columbia Gas & Electric—no par			a 43	33	44½
Commonwealth Power Corp.—no par			106	56	108
Consolidated Gas—no par			a 74½	60½	74½
Continental Gas & Electric			71½	49	73
Federal Light and Traction			a 86½	75	86½
General Gas & Electric			55	22	58
Lehigh Power Securities—no par			89	31	89
Middle West Utilities—no par			67	41	69
National Power & Light—no par			180	60	190
Philadelphia Co.—50			a 50½	42½	53½
Power Securities—no par			12	4	14
Public Service Corp. of N. J.—no par			a 60½	39	60½
Standard Gas & Electric—no par			a 38½	31½	38½
United Gas & Electric (Conn.)—no par			26	14	42
Utah Securities			a 35½	16½	37
BONDS					
Operating Companies					
Adirondack Power & Light	6s	1950	102½	97½	103
Alabama Power	5s	1946	95½	90½	96
Appalachian Power	5s	1941	94½	89	94½
Brooklyn Edison	5s	1949	a100½	97½	102½
	6s	1930	a106½	102½	106½
	7s	1940	a109½	107	110½
Central Indiana Power	6s	1947	193½	88	95
Cleveland Electric Illuminating	5s	1939	100	98½	100½
Commonwealth Edison	5s	1943	99½	95	100
	5s	1953	98	92	99½
§Consol. Gas, Elec. Lt. & Pwr.	4½s	1935	94½	91½	95
	6s	1949	104½	101½	105
	6½s	1951	a 108½	107	108½
Consumers' Power	5s	1936	98½	94½	99½
	5s	1952	a 90½	87	92½
Detroit Edison	5s	1933	100	99	100½
Duquesne Light	6s	1949	a105½	103½	106½
Great Western Power	5s	1946	95	90½	96
Kansas City Power & Light	5s	1952	a 93½	89	95½
Mississippi River Power	5s	1951	96½	92	97
Montana Power	5s	1943	a 98½	95	98½
New England Power	5s	1951	98½	97	100
New York Edison	6½s	1941	a112½	109½	112½
Niagara Falls Power	6s	1950	105½	104	105½
Northern States Power	5s	1941	a 94	89½	94
	6s	1948	104	101	104½
Ohio Power	7s	1951	106	103	106½
Pacific Gas & Electric	5s	1942	a 93½	90½	95
Pennsylvania Water & Power	5s	1940	99	96	99½
‡Philadelphia Electric	5s	1966	a101½	97	103½
	5½s	1947	a103½	99½	103½
	6s	1941	a107	102½	107½
Portland Electric Power	6s	1947	a 94½	89½	95½
Southern California Edison	5s	1939	98½	96	99
	6s	1944	102½	100	103½
Tennessee Electric Power	6s	1947	98	93½	98½
Texas Power & Light	5s	1937	95½	91½	95½
Toledo Edison	7s	1941	a108½	106	109
Utah Power & Light	5s	1944	a 91½	87½	93½
Holding Companies					
Alabama Traction, Light & Power	5s	1962	81½	65½	83
American Gas & Electric	6s	2014	94½	94	95½
American Power & Light	6s	2016	94½	91	94½
Amer. Water Works & Electric	5s	1934	a 92½	84½	94
Commonwealth Power	6s	1947	a 97½	87	97½
Consolidated Cities Lt., Pwr. & Tr.	5s	1962	74	64	75
Illinois Power & Light	6s	1953	99	95	100½
United Light & Railways	5s	1932	92½	87½	93½
	6s	1952	95½	92	96
ELECTRICAL MANUFACTURING COMPANIES					
PREFERRED STOCKS					
Allis-Chalmers Manufacturing			a100	90	100½
*National Carbon			122	112	125
Worthington Pump & Machinery		(A)	a 83	68	83
COMMON STOCKS					
Allis-Chalmers Manufacturing			a 63½	41½	66½
American Bosch Magneto—no par			a 26	22½	38½
Electric Storage Battery—no par			a 57½	50½	64
General Electric			a 264½	193½	281
General Electric—10			a 11½	10½	11½
*Hurley Machine—no par			a 64½	48	64½
†Wagner Electric			24½	20	34½
Westinghouse Electric & Manufacturing—50			a 63½	55½	65
Worthington Pump & Machinery			a 44½	23½	44½
BONDS					
Canada General Electric	6s	1942	106½	102½	107
General Electric	3½s	1942	83	80	83½
	5s	1952	a 104½	100	105
Robbins & Myers	7s	1952	80	75½	91½
†Wagner Electric Manufacturing	7s	....	100½	97	100½
Western Electric	5s	1944	a 98½	96	98½
Westinghouse Electric & Mfg.	7s	1931	a 109	106½	109½

* Chicago Stock Exchange. † St. Louis Stock Exchange. ‡ Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price Wednesday, September 24.

than the company has raised its capital obligations. Gross revenues in the given period increased 801 per cent and the kilowatt-hour sales 1,351 per cent. During that same time the company's funded debt was increased only 120 per cent.. Its capital stock and debt were increased only about 293 per cent.

Dividends Declared

The following quarterly dividends were announced by central-station companies and electrical manufacturing companies during the seven-day period ended September 23:

Name of Company	Per Cent	When Payable
Adirondack Power & Light, 8% pf..	2	Oct. 1
Adirondack Power & Light, 7% pf..	1¾	Oct. 1
Alabama Power, pf.	$1.75	Oct. 1
American Public Utilities, prior pf.	$1.75	Oct. 1
American Public Utilities, partic. pf.	$1.25	Oct. 1
Asheville Power & Light, pf.	$1.75	Oct. 1
Binghamton Light, Heat & Power, 7% pf.	1¾	Oct. 1
Binghamton Light, Heat & Power, 6% pf.	1½	Oct. 1
Carolina Power & Light, com.	$1.50	Nov. 1
Carolina Power & Light, pf.	$1.75	Oct. 1
Central Illinois Light, 6% pf.	1½	Oct. 1
Central Illinois Light, 7% pf.	1¾	Oct. 1
Eastern Kansas Power, pf.	1¾	Oct. 1
Florida Public Service, pf.	1¾	Oct. 1
Greenfield Electric Light & Power, com.	$2	Sept. 30
Greenfield Electric Light & Power, pf.	37c.	Sept. 30
Greenfield Electric Light & Power*	20c.	Sept. 30
Illinois Northern Utilities, pf.	$1.50	Nov. 1
Jersey Central Power & Light, pf.	$1.75	Oct. 1
Kansas Electric Power, pf.	1¾	Oct. 1
Kansas Gas & Electric, pf.	1¾	Oct. 1
Manchester Traction, Light & Pr	$2	Oct. 15
Memphis Power & Light, pf.	$1.75	Oct. 1
Mississippi River Power, pf.	1½	Oct. 1
New Jersey Power & Light, pf.	1¾	Oct. 1
Northern Indiana Gas & Electric, A pf.	1¾	Oct. 14
Northern States Power, pf.	1¾	Oct. 20
Northern States Power, com.	2	Nov. 1
Philadelphia Company, 6% pf.†	$1.50	Nov. 1
Puget Sound Power & Light, com.	$1	Oct. 15
Puget Sound Power & Light, prior preference	1¾	Oct. 15
Puget Sound Power & Light, pf.	1¾	Oct. 15
Rutland Railway, Light & Power, pf	1¾	Oct. 1
Savannah Electric & Power, pf.	3	Oct. 1
Savannah Electric & Power, debenture (1st pf.)	2	Oct. 1
Sayre Electric, pf.	1¾	Oct. 1
Shawinigan Water & Power	1¾	Oct. 10
Standard Gas & Electric, 7% pf.	1¾	Oct. 25
Standard Gas & Electric, com.	75c.	Oct. 25
Turners Falls Power & Electric, com.	$1.50	Sept. 30
Turners Falls Power & Electric*	15c.	Sept. 30
Vermont Hydro-Electric, pf.	1¾	Oct. 1
Virginia Railway & Power, pf.	$1.50	Oct. 20
Washington Water & Power	$2	Oct. 15
Williamson Electric, pf.	2	Oct. 1
Yadkin River Power, pf.	$1.75	Oct. 1
Electric Vacuum Cleaner, pf.	1¾	Oct. 1
Emerson Electric Mfg., pf.	1¾	Oct. 1
Johns-Manville, Inc.	75c.	Oct. 1
Wagner Electric, pf.	1¾	Oct. 1
Worthington Pump & Mach., pf., A	1¾	Oct. 1
Worthington Pump & Mach., pf., B	1¾	Oct. 1

* Employees' stock. †Semi-annual.

Company Reports

Among the company reports issued during the past week for the month of August are the following:

Name of Company	Gross Revenue for August 1924	August 1923
Alabama Power	$734,598	$624,679
Appalachian Power	309,027	293,443
Cities Service	1,145,476	1,132,547
Detroit Edison	2,303,638	2,317,735
Grafton County Electric Light & Power	15,808	14,321
Kansas City Power & Light	678,608	632,908
Niagara, Lockport & Ontario Power and subsidiaries	462,309	454,737
Public Service Corp. of New Jersey	6,566,923	4,204,819
Republic Railway & Light	796,788	848,481
Southern Utilities	242,729	190,268
Staten Island Edison and affiliated companies	233,229	216,852
York Utilities	11,515	23,756

New Utility Financing

Five Companies, Taking Advantage of Easy Money, Offer Bonds for $27,793,000

THE price at which new capital may be obtained is uncommonly low now, in part because industry in general has slackened its pace. Increasing demands for service in the case of most power and light companies have, however, more than offset the general depression. Utilities are taking advantage of the cheap rates. Five companies entered the market for new money during the week ended September 23 and sold bonds to the amount of $27,793,000.

The fifteen-million-dollar issue of Public Service Electric & Gas Company first and refunding mortgage 5½'s, due in 1964, which was the largest individual offering of the week, was the first public offering of bonds that has been made since the Public Service Corporation of New Jersey revised its old capital structure. The real object of the reorganization was to provide a way to offer bonds directly against the operating properties and to create an open-end lien. The new first and refunding mortgage 5½'s, which the bankers have sold at 96½ to yield 5.70 per cent, represent the strongest security which it is possible for Public Service to offer the public under its new and greatly improved set-up. There are now altogether $41,586,000 of the first and refunding bonds outstanding, counting the $26,586,000 issued in exchange for the old Public Service Corporation of New Jersey general mortgage 5's of 1959. Public Service Electric & Gas Company is borrowing at this time to carry on development work and make certain plant extensions.

The five-million-dollar issue of Puget Sound Power & Light Company first and refunding mortgage 5½'s, due in 1949, the second largest issue of the week, also was offered on a 5.70 per cent yield basis. Business depression probably has taken its severest tolls in the Northwest, but here is a power and light company in the far Northwest which is having steadily to increase its generating capacity to keep up with the demand for services. Its installed generating capacity is 169,720 hp., and an additional 21,000 hp. will be turned in yet this year. The new money is to hasten the installation of still more power, however, and the company expects to add an additional 48,000 hp. by the fall of 1925 through the completion of the Baker River plant, for which it is now borrowing.

Among the other issues floated during the week were the Central States Electric Corporation's notes, amounting to $3,000,000, the Southwestern Power & Light Company's bonds, amounting to $3,500,000, and the Indiana Service Corporation's bonds, amounting to $1,293,000.

Continental Gas & Electric Purchases Stock.—The Continental Gas & Electric Corporation has purchased from the Illinois Power & Light Company the minority stock of the Kansas City Power Securities Corporation, which company owns all the common stock of the Kansas City Power & Light Company. It will be remembered that this minority stock, amounting to about 30 per cent of that outstanding, was purchased from J. Ogden Armour of Chicago by the Illinois Power & Light Company late last year, a short time before the Continental Gas & Electric Corporation acquired the majority interest in Kansas City stock. The recent transfer of this minority stock gave the Continental ownership of 98.7 per cent of the outstanding stock of the Kansas City Power Securities Corporation. It has also purchased from the treasurer of the company the remaining authorized common stock, amounting to 25,000 shares.

Some Public Utility Income Statistics.—In analyzing the statistics of income for 1921 compiled by the Bureau of Internal Revenue, the National City Bank among other things says: "Corporations engaged in selling services, as distinguished from commodities, as railroads, street-car companies, lighting and power companies, telephone companies, etc., do not show as heavy losses as manufacturing companies generally, for one reason because they did not suffer as much from the depreciation of inventories. Other reasons are that they met the falling off of receipts in part by drastic reduction of maintenance expenditures and in some instances were able to get prompt permission to increase charges. The grand total for transportation and all other public utility corporations shows 19,105 returns, of which 11,831 reported net incomes aggregating $821,871,454, upon which the federal taxes were $101,021,765, while 7,274 reported deficits aggregating $323,368,793.

McMillin Holdings Sold to Bankers.—The Emerson McMillin estate's holdings in the American Light & Traction Company have been acquired by a group of bankers headed by H. F. McConnell & Company of New York and including Frank T. Hulswit and associates. Mr. Hulswit is president of the United Light & Power Company, which was incorporated early this year in Maryland to succeed the United Light & Railways Company. The late Emerson McMillin was the original president of the American Light & Traction Company, but, though a dominant factor in the company's affairs, he did not have ownership control of the company.

Company Organized to Handle Security Sales.—The Utility Securities Company, which represents a large number of power, light and traction corporations operating in the Middle West, has opened an office in the Northern Indiana Gas & Electric Company Building at South Bend, Ind., where the sale of securities for the utility group headed by the Northern Indiana Gas & Electric Company, the Commonwealth Edison Company, the People's Gas Light & Coke Company, the Middle West Utilities Company, the Public Service Company of Northern Illinois, the Northwestern Utility Company, the Interstate Public Service Company and the Chicago Rapid Transit Company will be handled. Fred Tillson is in charge of the office.

Recent Court Decisions

Kansas Utility's Contract to Light and Heat Public Buildings Without Charge Sustained.—In Western Distributing Company vs. City of Mulvane, the Supreme Court of Kansas has declared that a contract between a city and a utility company by which gas for heating and illuminating its public buildings was to be furnished without charge in exchange for a franchise was not abrogated by a general order of the state Industrial Court that certain rates were reasonable and might be charged to ordinary consumers with whom no contracts had been made. (227 Pac. 362.)*

Washington State Supreme Court Sustains Power of Commission to Disregard Franchise.—Declaring that the Legislature may constitutionally vest in the Department of Public Works power to regulate rates to be charged for service of a public utility, even though rates are fixed by a franchise under which the utility operates, and asserting it to be immaterial that franchise rates relate to services rendered to the municipality by which the franchise was granted, the Supreme Court of the State of Washington, in Monroe Water Company vs. Town of Monroe, sustained judgment for the plaintiff and ordered the defendant community to make payments it had held up. (227 Pac. 516.)

Corporation Cannot Be Both Public Utility and Private Company.—The Supreme Court of Arkansas upset the contention of the Arkansas National Gas Company of Little Rock—which appealed from the decree of the trial court in a suit brought against it by the Norton Company and others—that though the gas company is a public utility so far as supplying domestic and industrial consumers in the city of Little Rock is concerned, it is not a public utility with reference to companies outside of Little Rock and which it is claimed, on account of their peculiar location and of the large amount of gas they use, are not susceptible of being classified. No company, said the court, can "be considered as a public utility with respect to certain classes of its consumers and as a private corporation with regard to certain others. The acceptance by the Arkansas Natural Gas Company of the franchise and privileges granted it carried with it the duty of supplying all persons and corporations along the lines without discrimination. All are entitled to have the same service on equal terms and at a uniform rate. The law will not tolerate a discrimination in the charges of public utility corporations. If this were not so, and if corporations existing by grant of public franchises in supplying water, gas, electric light and the like could favor certain individuals or corporations with low rates and charge others higher rates for the same service, the business interests and domestic comforts of every one would be at their mercy." The court recognized, however, the principle of proper classification of customers as not in conflict with the broad principle laid down. (263 S. W. 775.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Powers of Louisiana Commission.—In Baton Rouge Waterworks Company vs. Louisiana Public Service Commission the city contested the authority claimed by the commission to fix rates for water service in Baton Rouge and claimed this right for itself. The Supreme Court of Louisiana sustained the city's contention, declaring that the city of Baton Rouge at the time of the adoption of the state constitution of 1921 was vested with the power to regulate, supervise and control the Baton Rouge Waterworks Company and to make rates to govern the water supplied by the said company, and this power was not withdrawn or affected by anything said in the constitution conferring similar powers on the Public Service Commission, but was expressly reserved to the said city by the terms of the basic law. (120 So. 710.)

Acceptance of Rate-Regulating Ordinance Passed Without Authority Makes Binding Contract.—Reversing a decree granting an injunction to the city of Frankfort against the Frankfort Natural Gas Company, which had raised its rates to the maximum figure allowed by its contract, the Court of Appeals of Kentucky said that where a municipality is without power to regulate rates charged for gas, but passes an ordinance purporting to regulate them which is accepted by the gas company, the ordinance constitutes a binding contract between the municipality and the company. Hence a franchise accepted by the company, requiring it to sell its gas at the commencement of the term for 40 cents and providing that it should not charge at any time during the term more than 50 cents, entitles the gas company to raise its rates to 50 cents after a reasonable time, at its discretion. (263 S. W. 710.)

What Constitutes "Ordinary Care" in Guarding Pole Holes Left Open at Night.—While constructing a distribution line in Evarts, Ky., the Kentucky Utilities Company left a pole hole open at night, though covered by boards. The boards were removed, presumably by children, and a pedestrian who fell into the hole was injured and recovered damages (Howard vs. Kentucky Utilities Company). The Court of Appeals of the state has reversed the verdict and remanded the case for retrial because of an instruction in the trial court that the jury should find for the plaintiff if it believed that "by leaving the said hole open, or by failing to keep it safely covered, or by failing to leave and keep some sort of a signal light or warning to place the public on its notice of such hole or obstruction," the company failed to exercise care. The only issue, the Court of Appeals said, was whether simply placing planks over the hole was or was not the exercise of ordinary care. (263 S. W. 360.)

Commission Rulings

Principles Governing Authorization of Bond Issues.—Denying to the Mobile Gas Company authority to make a desired bond issue, the Alabama Public Service Commission said that bonds should not be issued against good will or going-concern value, especially when the provisions of the mortgage under which the bonds are to be issued contemplate that bonds shall be based upon physical property, and that bonds should not be issued upon the basis of appreciation in value over the actual and reasonable cost of property, especially in a case where a deed of trust provides that bonds issued thereunder shall not exceed 80 per cent of the actual and reasonable cost of permament extensions, enlargements and additions to the property of the utility company.

What Contribution Should Be Made by New Consumers on Line?—The only fair basis for an enforced contribution toward the cost of an electric extension is the cost of providing the service and not the value of the property of the man to whom the service is provided, according to a decision of the Missouri Public Service Commission in a complaint made against the Union Electric Light & Power Company, where complainants attempted to have the conditions of extensions to future applicants prescribed. The commission said: "Complainants are justified in insisting that future applicants for service from this line should bear some portion of the burden imposed on them in obtaining its original construction. What contribution such future applicants should make, however, should be determined when application is made by them for service and not in advance of such application. It was perfectly proper for the complainants to distribute among themselves the $4,000 advance required by the company in accordance with any principle of distribution that seemed proper to them. They saw fit to make the distribution upon the basis of the several values of their various property holdings, each paying 4 per cent of the assessed value of his property. The receipt which the complainants ask the commission to approve proposes an assessment upon future applicants for service upon the same basis. It is fair to state now that such a basis for the levying of future contributions would not be enforced by this commission. . . . The fourth alternative in that part of the proposed receipt hereinbefore quoted is that the company shall not furnish service to any future applicant unless he first obtains 'an order from the Public Service Commission setting out the terms and conditions upon which he may be entitled to have service.' There can be no objection to the issuance by the company of a receipt containing such a restriction as this," the commission held.

Manufacturing and Markets

Revival of Industry in Germany

Hope and Financial Soundness Have Replaced Despair and Inflation -Stabilization of the Mark Killed Speculation and Orgy of Spending

By E. J. Mehren
Vice-President McGraw-Hill Company, Inc.

NO OTHER country in the world today is, from the economic viewpoint, so interesting as Germany. She occupies the spotlight in Europe. What is to be her future? is the question that every one in the Old World is asking. The answer to that question no one can tell. The problem is complicated. But this even the casual visitor to Germany can say: Germany has made tremendous strides since the war; she is showing extraordinary recuperative power against tremendous handicaps; she has worked a financial miracle since November of last year, and, finally, no nation that shows Germany's potential strength can be permanently kept down or can be crushed.

These observations, let me repeat, even the casual visitor must make. The signs are written everywhere—in a people again well nourished, in a public administrative ability (irrespective of party) that was able without new revolution to stabilize the currency, in a returning hope that Germany can again rise. There is not buoyancy of spirit, but there is a deep-founded confidence that the nation is not going to pieces.

Germany's Handicaps

Let us briefly paint the picture of Germany's economic circumstances:

Under the Versailles treaty or as a result of it she lost heavily of her iron and coal deposits—in Alsace-Lorraine, the Saar and Upper Silesia; she lost her colonies, her foreign investments, her shipping, her export organization and its connections; she has a large part of her territory under the control of her former enemies. In addition she has been through an exhausting war and a political revolution.

Since then, since 1920, two other financial disasters have forced themselves into the picture—the occupation of the great industrial district of the Ruhr and the wrecking of the currency. With these added calamities one should logically expect that conditions would be worse instead of better, that the despair would be even blacker than before. And yet conditions are as I have described—immeasurably better. Here is a nation on the upgrade rather than the down. Here is a nation to be reckoned with economically, not to be ignored; here is a nation that is sure to be an important factor in the world's industry.

The great German economic miracle was wrought in the closing months of 1923 and the early part of 1924. Early last autumn Germany truly was at the crossroads, to use the words of Basil Miles, administrative commissioner for the United States in the International Chamber of Commerce. Directly ahead—on the road she was traveling, the road of unbalanced budgets, of state subsidy of the railroads, of currency debasement—was revolution, industrial suicide, destruction. To the right was a stormy path, extremely difficult, beset possibly by disorder, possibly by revolution, but leading, if the difficulties could be mastered, to economic soundness. It was the road of a stabilized currency, with its accompaniments of balanced budgets and governmental economy.

Germany chose to go to the right, to take the difficult road, to bear the stress of financial reform and currency stabilization. She did it at a time, too, when the situation in the Ruhr was at its most critical stage, when strong forces were seeking to pry loose the Rhineland and erect it into an independent state, when the attitude of Bavaria toward the rest of Germany was much in doubt. But she went on nevertheless. The government declared that the mark should be stabilized at four trillion two hundred billion to the dollar. There was a severe contest with the mark speculators, but by severe measures the government won, and since November, 1923, legally, and about January 1, actually, the rentenmark has stood at 23.8 cents to the dollar. There was no revolution.

That achievement marked the turn. It showed the return of administrative strength in the German government. It restored business to a sound basis. It killed speculation and the orgy of spending. It restored the incentive to save and therefore to work. It marked the end of the crisis in the economic and social disease and the beginning of recovery.

Germany is beyond the crossroads and has chosen rightly. The future is long and difficult, but there is health where there was disease, there is hope where there was despair.

Details Briefly Told

Let me now add some details—briefly. They will help to an understanding of the situation. Each item deserves elaboration, but that would take much space:

1. The severest present industrial handicap is lack of credit. The great credit reservoirs were nearly or entirely wiped out by the fall of the mark. Further, there was no incentive to save; industries and individuals converted the tobogganing mark into goods as quickly as possible. Today the credit resources of the banks are estimated at one-tenth the pre-war amount. When credits are obtained the interest rate is 2½ per cent per month for the very best security.

2. There is a terrific money shortage, which also curtails business, for with lack of credit every one tries to insist on cash on delivery.

3. Wages are at approximately pre-war level. Prices, as of July 15 (according to the *Frankfurter Zeitung* index, the highest index I could find and which takes in ninety-eight commodities), are 34 per cent above 1913. (The government's index for wholesale prices is 12 per cent above 1913.)

4. Efficiency of labor has increased notably and is still increasing. I heard no general complaint against the workingman in Germany as I did in England.

5. Non-employment, while fairly large just now, is not so prevalent as in Great Britain and does not present the all-engrossing problem in Germany that it does in the British Isles.

6. The works councils, elected by the workers, are said by the employers to be a good influence. They help smooth out difficulties and, in general, have not been radical.

7. Hours of work per day are increasing.

8. The coal supply, which by its shortage was expected to be for many years a serious handicap to German industry, is now more than ample on

account of the very large development of lignite deposits.

9. The heavy taxes imposed on industry and individuals are beginning, under the stabilized rentenmark, to yield a good revenue. Recent figures show a surplus that has been used to retire obligations.

There is much more to be said and the details just given need elaboration. But these few particulars will help to fill out the picture as I saw it—the picture of an industrial nation again on a sound basis, well organized, confident that somehow it will work out its difficulties and play a part in the world of industry and commerce.

Analysis of Merchandise Sales Possibilities

THE Northeast central section of the United States, comprising Ohio, Indiana, Illinois, Michigan and Wisconsin, leads as a potential market for electrical merchandising lines, according to an engineering analysis of the relative sales possibilities of different areas made by the Department of Commerce and contained in a booklet "Domestic Market Possibilities for Electrical Merchandising lines." The booklet is intended as a guide whereby manufacturers may determine the possibilities for market expansion in a given territory and how much sales effort a territory might justify.

Based upon definite statistical data, modified as specifically as possible according to varying conditions in different sections of the country, the study shows that New York ranks first with a ratio of a potential 11 per cent of the total electrical merchandising business of the country, followed by Pennsylvania with 8.5 per cent, Illinois with 7.3 per cent, California with 6.3 per cent and Ohio with 6.2 per cent. It is pointed out that the desire to use modern home comforts, or what is termed the "inclination to purchase" electrical goods for household or individual use, varies considerably in different states and is generally lowest in the East and Southeast, while it increases gradually from there to the Pacific Coast.

A Step Toward Uniformity in Wiring

With the National Electrical Code an American Standard and a Model Ordinance and Statute in Prospect, We Are Making Progress Toward Inspection Uniformity

BY C. A. BATES
Bryant Electric Company, Bridgeport, Conn.

A GREAT many electrical men apparently do not realize that the status of the National Electrical Code has changed in the past two years. As in the case of the 1920 edition of the code, which was submitted to and approved by the American Engineering Standards Committee, the 1923 edition was laid before that committee for approval, and this has just been extended. Approval by the A. E. S. C. materially changes the industry's opinion of the code and gives us a standard of wiring that is no longer controlled by the fire insurance interests. The present code is truly an American standard, because the approval by the American Engineering Standards Committee means that all branches of the industry, as well as several government departments, must have indorsed it before approval could be given. It is probable that the electrical committee, which heretofore has had charge of the revisions of the code, will be reconstituted to be in effect a sectional committee of the American Engineering Standards Committee, and, by this means, delays in the adoption of the code as an American standard will be eliminated.

INFLUENCE OF POLITICS

The approval of the code as an American standard is a long step forward and helps to solve a problem that has been before the electrical industry for many years. This problem is how the industry is to meet different laws in states and cities and still do business on a low cost basis. Probably the manufacturers, jobbers and contractors are the most affected, but higher costs of manufacture and distribution must necessarily affect the whole industry.

The differences in statutes in different states and ordinances in different cities arise from several causes, but I think we can call politics a large factor. The laws, to be of most value to the industry, should conform as closely as possible to the National Electrical Code and should be kept up to date and revised as new revisions of the code are issued.

These much needed revisions of the laws are sometimes difficult to obtain because of political and other reasons, especially where the statutes or ordinances contain a detailed set of wiring rules. The result is that today some cities are working under rules as old as the 1910 edition of the code, and from there up to the 1923 edition.

In the past lawyers have said that a city or state must put all the rules in the laws and that the power to make rules could not be delegated to a body like the electrical committee. The approval of the code as an American standard seemed to provide an opportunity to change the existing order and permit the adoption of statutes and ordinances which would be flexible enough to overcome the difficulties met with in the past.

PROVIDING MODELS

The Electrical Manufacturers' Council, therefore, asked its law committee to study the situation and to produce a uniform type of statute for states and a uniform ordinance for cities and towns. These have now been completed and will very shortly be released. The uniform laws are only a groundwork, of course, containing the essentials as to the adoption of the code and do not contain details, which the states and cities will think necessary to have in various forms.

The uniform statute sets up a committee, to be known as a Board of Building Standards, that will have in its charge not only electrical rules, but also general building rules, plumbing, etc. To this board is delegated the authority to adopt such rules as it may see fit, and it therefore has the power to adopt the new editions of the National Electrical Code as they come out. Because of the authority vested in this body it is not necessary to enact a new state statute to keep abreast of the times in building construction. Last year the State of Ohio enacted a law based upon this uniform statute, and while the law is not a copy of the uniform statute, it does provide that the Board of Building Standards shall have the authority to permit the use of systems or materials which, in its opinion, are the equivalent of systems or materials called for in the statute.

The uniform ordinance in its short form provides for an electrical inspector whose duty it shall be to

see that electrical installations are safe and in conformity with the most approved methods of construction. The National Electrical Code, as approved by the American Engineering Standards Committee, and the National Electrical Safety Code, as approved by the American Engineering Standards Committee, shall be prima facie evidence of such most approved methods. The rest of the ordinance covers details that may be changed as desired.

To Keep Wiring Up to Date

It is seen that this provides a means for keeping the wiring rules up to date and makes the inspector responsible for so doing. Nothing in the ordinance prevents the adoption of special rules, if they are necessary, but it was the hope that the adoption of the uniform ordinance would promote the uniform use of the National Electrical Code and tend to decrease the adoption of special rules.

It is my understanding that San Antonio, Texas, has adopted an ordinance which is in spirit what I am describing to you. It is being considered, or has been adopted, in some other cities. The proposed statute and ordinance are simple, flexible arrangements to provide for what should be of benefit to us all—namely, uniform rules for electrical installations and materials.

Trade Statistics Controversy Dormant

APPARENTLY the Department of Justice wanted to place the entire controversy with regard to trade association statistics in cold storage until after the election. A definite opinion is expected to be obtained at a conference to be held in October and arranged for by a committee representing the Chamber of Commerce of the United States. It is regarded as virtually certain that the department will take no exception to any association which collects statistics of production and stocks, and communicates only aggregates to its members.

The stand taken by the American Federation of Labor in opposing undue limitation of trade association activities is expected to discourage any demagogic attacks.

Business Conditions

BUSINESS can be classed as in fair volume in nearly the entire country. Estimates of sales of the General Electric Company for the quarter ending September 30 are expected to show a decrease of not more than 10 per cent as compared with the corresponding quarter in 1923. Some good orders have been received by manufacturers and jobbers from industrials, and there is evidence of a preparation by them for increasing operations. Prices as a whole are holding firmer, and a strengthening confidence on the part of buyers is being expressed in the placing of unsolicited orders.

In New England a steady improvement of trade conditions, and industrial electric heating equipment has become more active as the result of an exhibit held in Boston. Good sales have been reported in the New York district during the last two weeks, but conditions are spotty. Much central-station activity is either planned or under way in this territory. In the Southeast business is satisfactory, with Florida leading in volume of sales, and line and construction materials are active. Orders for needed material are being placed in the Middle West, and the demand for poles, pole-line hardware and high-tension equipment is unusually brisk. Appliance sales have been good in this district. On the Pacific Coast an uncertain market has produced cautious buying by all classes of trade, particularly the railroads.

Increasing Demand for Insulator Testers

IF THE demand for safety insulator testers continues to grow at the present rate for the rest of the year, our 1924 business will be double that 'of 1923 and four times that of 1922," said F. C. Doble, president of the Doble Engineering Company, Cambridge, Mass., in a recent discussion of business conditions. Domestic business is steadily increasing and foreign orders for this service are coming to the front, two recent shipments of apparatus having been made to Brazil and Chile. During the last six months a number of central-station holding companies and operating syndicates in this country have entered into blanket contracts with the Doble company for testing by the safety telephonic method.

Non-Ferrous Metal Market Quiet —Slight Declines Registered

SLIGHT declines have been registered in the copper, lead and zinc markets, which have been unusually quiet during the week ended September 24. Marked price fluctuations in tin have taken place, there having been a decline of 2 cents per pound in three days and then a recovery of nearly all the ground lost.

NEW YORK METAL MARKET PRICES

	Sept. 17, 1924 Cents per Pound	Sept. 24, 1924 Cents per Pound
Copper, electrolytic	13 -13¼	12.975
Lead, Am. S. & R. price	8	8
Antimony	11¼	11¼
Nickel, ingot	27½	27½
Zinc, spot	6½	6.45
Tin, Straits	47½	47¼
Aluminum, 98 to 99 per cent	28	28

The present hesitation on the part of the buyers is believed to be due to the uncertain market. More copper has been sold for export than for domestic use, and not only has the demand been less but inquiries have decreased. The price has been 13 cents per pound, but some shading of this price took place.

The official contract price of the American Smelting & Refining Company for lead remains at 8 cents with the demand still quiet. Slight premiums have been obtained over this price, but sales were mostly made at the 8-cent level. The present trend is uncertain.

The demand for zinc has been fair, but at decreasing prices. Galvanizers, who have been the chief purchasers, are said to be now operating at 50 per cent capacity as against 35 per cent capacity for the last few months.

The price of tin has fluctuated violently this week on account of heavy speculation on the London market. Sales to domestic consumers have been good.

Upward Trend Holds in New England

A STEADY, gratifying improvement of trade continues in the New England district, devoid of the spectacular but distinctly encouraging as to fall outlook. Contractor-dealer buying is steady; central-station construction requirements are not so voluminous, but retail sales are gaining in the appliance field and kitchen-lighting units are making more impression on weekly reports of merchandising departments. Prices are weak in loom, wire and conduit boxes. Electrical outputs are showing rapid growth.

A leading vacuum-cleaner distributor reports sales 15 per cent ahead of last year in New England. Radio sets are moving in increasing numbers. The Boston Edison company has opened a radio department in its electric shop and is selling high-grade sets with increasing success. The opening of a 500-watt broadcasting station by this company next week is expected to stimulate the radio market in this section. Industrial electric heating equipment is more active as a result of a fine exhibit held at the Commonwealth Pier, Boston, in connection with a convention of the American Society for Steel Treating.

Sales Spotty in New York District —Unsolicited Orders Increase

SOME good orders have been received within the last two weeks from industrials in the New York district, including orders for some steel-mill equipment. However, conditions are generally spotty, with the feeling expressed that an improving fall business can be expected. A central-station company in this district reports that

budgets for its 1924-25 construction are larger than they have ever been and that the gain in meters set this year has been probably the largest in the history of the industry. No cessation of work is looked for by this utility.

Jobbers report that buyers are showing more confidence, and a marked change in their attitude is expressed in unsolicited orders in larger numbers as well as in the statement of industrial executives that they are preparing for an increase in operations. All lines are moving equally well with the exception of appliances, the sales on which have not shown similar increases.

No Hold-Off on Needed Purchases Evident in Middle West

SATURDAY closed another good business week in the Middle West. Although purchasing has not been so active as last week, the tendency to buy what is needed is being more and more demonstrated. Central-station purchases dropped off a trifle, with the demand for poles, pole-line hardware and high-tension equipment unusually brisk. Construction work is being pushed to completion, but the number of orders placed is more noticeable than the value involved. Building activity continues, although the number of permits issued this week was less than that for a year ago.

The jobbers report a fair amount of business. One jobber undertook to sell a certain commodity at his cost price to stimulate business in other lines, but the effect appears to have been to demoralize sales in that particular item and to retard an otherwise healthy condition. Appliance sales have been particularly good, with washing machines and vacuum cleaners heading the list.

Prices remain generally firm. Considerable interest was aroused in the Middle West by the abolishing of "Pittsburgh plus" this week. With the establishing of a conduit plant in Chicago, speculation is rife as to what the price of conduit will be. It would seem that conduit should advance to absorb the freight, although the Western manufacturer may force the price down. Armored cable has been selling at the same price for some time, but this week one manufacturer announced an increase of $2 per 1,000 ft. in quantities less than a carload.

VALUE OF ELECTRICAL EXPORTS FOR JULY, 1924, COMPARED WITH CORRESPONDING MONTH IN 1923

(Issued by Bureau of Foreign and Domestic Commerce)

	July 1923	July 1924
Generators:		
Direct-current:		
Under 500 kw.	$66,638	*$92,046
500 kw. and over	53,215	29,876
Alternating-current:		
Under 2,000 kva.	4,989	5,274
2,000 kva. and over	95,848	81,581
Steam turbine-generator sets	*	1,467
Accessories and parts for generators	59,757	174,716
Self-contained lighting outfits	56,723	60,424
Batteries:		
Primary	104,979	†
Flashlight	*	67,554
Other primary	*	75,683
Storage	218,863	206,395
Transforming or converting apparatus:		
Power transformers	360,772	298,817
Other transformers	62,107	181,408
Rectifiers, double-current and motor generators, dynamotors, synchronous and other converters	53,326	39,249
Tranamission and distribution apparatus:		
Switchboard panels, except telephone	228,834	196,480
Switches and circuit breakers over 10 amp.	186,134	222,362
Fuses and fuse blocks	18,386	17,087
Watt-hour and measuring meters	45,161	21,196
Volt, watt and ampere meters and other recording, indicating and testing apparatus	87,665	117,424
Lightning arresters, choke coils, reactors and other protective devices	92,961	69,381
Motors, starters and controllers:		
Motors under 1 hp.	117,195	113,943
Stationary motors:		
1 hp. to 200 hp.	189,334	150,025
Over 200 hp.	100,789	24,213
Railway motors	196,416	109,504
Electric locomotives:		
Railway	273,246	411,495
Mining and industrial	5,852	17,456
Other motors	8,136	†
Starting and controlling equipment	142,030	†
For industrial motors	*	102,546
For electric railway and vehicle motors	*	1,090
Accessories and parts for motors	159,980	117,771
Electric appliances:		
Electric fans	50,147	77,747
Electric lamps:		
Incandescent:		
Carbon-filament	4,168	2,855
Metal-filament	82,949	101,655
Other electric lamps	$17,989	$29,280
Flashlights	52,974	67,548
Searchlights and projectors	52,164	35,228
Motor-driven household devices	71,207	69,592
Domestic heating and cooking devices	54,476	64,170
Industrial electric furnaces and ovens	27,177	20,643
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc.	78,106	83,042
Signal and communication devices:		
Radio and wireless apparatus	682,885	297,586
Telegraph apparatus	43,091	20,608
Telephone apparatus:		
Magneto telephones	32,950	16,346
Other telephones	23,976	19,306
Magneto switchboards	475	854
Other telephone switchboards	12,033	159,123
Other telephone equipment	*	135,321
Railway signals, switches and attachments	53,983	88,245
Bells, buzzers, annunciators and alarms	10,223	9,991
Other electric apparatus:		
Spark plugs, magnetos and other ignition apparatus	162,520	168,629
Insulating material	107,352	95,345
Metal conduit, outlet and switch boxes	47,703	49,676
Sockets, receptacles and lighting switches	83,490	96,589
Other wiring supplies and fixtures	148,046	†
Electric-lighting fixtures, interior and street	*	40,684
Other wiring supplies and line material	*	81,900
Other electrical apparatus, not elsewhere specified	742,258	522,292
Globes and shades for lighting fixtures	44,498	25,416
Electrical glassware, except for lighting	17,643	20,889
Electrical porcelain	143,820	114,193
Electrical carbons, carbon brushes, electrodes	215,289	184,661
Insulated wire and cable (iron and steel)	53,160	33,664
Other manufactures of aluminum	169,919	123,373
Copper, bare wire	218,227	109,970
Copper, insulated wires and cables	255,950	267,425
Total electrical machinery and apparatus and supplies	$6,750,104	$6,240,409

*Not separately stated prior to January 1, 1924 † Discontinued beginning January 1, 1924.

Satisfactory Sales in Southeast—Florida Leads in Volume

BUSINESS conditions in the Southeast are improving. Electrical jobbers report that sales throughout the territory are satisfactory with a steady improvement to be noted, though Florida has been leading and continues to lead in volume. Line and construction materials are moving most actively in that state. The fall outlook in all lines of electrical materials is very bright. Radio sales are good, one of the largest jobbers reporting that his business at present is 25 per cent in excess of the same period last year. The demand is for the better class of complete sets, with the demand for parts decreasing steadily. The cotton crop forecast for Georgia estimates 12,596,000 bales, which will put approximately $150,000,000 in circulation in the rural districts. Building permits in nine Southeastern states for August were valued at $54,936,100, and this volume indicates that electrical construction materials will continue to move briskly.

An improvement is reported in the sale of batteries for mine locomotive and for industrial truck use, while batteries for remote-control apparatus, which have moved satisfactorily throughout the year, continue brisk. Increased interest in electric commercial trucks is to be noted in certain sections, with prospects of the installation of fleets in several cities. Starting and lighting batteries are in brisk demand, though competition has forced prices down till the margin of profit is very slim. Retail electrical business in Atlanta has slowed up since September 1, but this is usual.

Market Uncertain and Buying Cautious on the Pacific Coast

AN UNCERTAIN market has produced exceedingly cautious buying by all classes of trade in the southern section of the Pacific Coast, particularly the railroads. A reduction of 5 per cent in rubber-covered wire has found the trade with large stocks purchased in anticipation of an increase. Industrial business, however, is fairly good. Some good orders for lighting units have been reported, chiefly for office buildings. A multiplication of locally manufactured portables are selling well. The establishment of a chain of modern moving picture houses in the territory has produced some good though rather special business. Appliance sales are only fair despite a few exceptional cases.

Sales to contractor-dealers in the Pacific Northwest have slackened during the past week, but domestic appliances are moving well, while the demand for farm-lighting plants is starting. The announced plan of the city of Seattle to erect a two-hundred-and-fifty-thousand-dollar warehouse for the municipal lighting department by day labor has been set aside and a new call for bids issued, the proposals to be opened October 3. Awards for a considerable amount of hydro-electric generating equipment for use in the state of Washington are expected to be placed shortly.

Activities of the Trade

General Electric Orders for Third Quarter Probably $60,000,000

Bookings of the General Electric Company for the quarter ending September 30 are expected to be about $60,000,000. In the corresponding three months of last year bookings were $65,483,549, and the figures also compare with $71,219,984 for the quarter ended June 30. It is reported that thus far in September there has not been a consistent increase in orders, although optimism is expressed as to the results which the last quarter of the year will produce.

Under these conditions it is quite probable that the total sales billed for the year 1924 will be nearly equal to $271,309,695, the volume in 1923. Unfilled orders have been reduced about $25,000,000 from the $87,112,000 shown at the close of last year.

Hynes & Cox Electric Corporation Newly Organized

The Hynes & Cox Electric Corporation, 36 State Street, Albany, N. Y., has been formed to enlarge and carry on the electrical heating business established by Lee P. Hynes. Mr. Hynes has been engaged in heating and electrical control work for more than twenty years and for the past eight years has been with the Consolidated Car Heating Company of Albany. He will still act as the consulting engineer of the last-named company in connection with railway work.

The new firm will handle industrial work, but will not deal in any materials which conflict with the work of the Consolidated Car Heating Company. It will deal in many classes of electric heating and control equipment, including various types of electric heaters, electric steam boilers, electric rheostats, electric temperature control, electric signal systems and electric design and testing.

Electrical Engineers Equipment Appoints Representatives

Clapp & LaMoree, with headquarters at Los Angeles, Cal., have been appointed representatives in central and northern California and the Pacific Northwest by the Electrical Engineers' Equipment Company, 710 West Madison Street, Chicago, manufacturer of line and station equipment. For a number of years the company has been represented by this firm at Los Angeles only. The San Francisco office, which will handle the business in central and northern California, is in the Electric Building, San Francisco, in charge of Stephen E. Dunn. The Pacific Northwest office will be at Portland, Ore., Commonwealth Building, in charge of Joseph Paulson.

Lyman C. Reed, 515 South Peters Street, New Orleans, has been appointed the representative of the company in Louisiana and Mississippi.

Western Electric Company Sales Increase

An increase of $37,676,000 in the sales of the Western Electric Company is reported for the first eight months of 1924, during which the billings reached a total of $195,167,000. Orders received during the first eight months of this year totaled $198,892,000 or $7,566,000 more than the orders received during the same period of 1923.

Stockholders of Emerson Electric in Dissension

L. C. R. Meston, brother of the former president of the Emerson Electric Manufacturing Company, St. Louis, representing the minority stockholders, has made an application in the Circuit Court of St. Louis for the appointment of a receiver for the Emerson company.

It is reported that there is no question of assets or liabilities involved. The present situation is said to be only a matter of internal dissension. The complaint charges that there has been a misappropriation of profits on the part of the majority stockholders, who are the present officials and members of the board of directors of the company.

Western Electric Building Eleven-Story Addition

An eleven-story addition to the present plant of the Western Electric Company will be erected on a plot, 81 ft. x 128 ft., at the southwest corner of Washington and Bethune Streets, New York. Present buildings on the property are being demolished and work has been started on the excavation. There are now 3,300 employees in the engineering department of the company, so that it has become necessary to provide additional facilities.

The A. C. Dunham Company, Marshalltown, Iowa, manufacturer of heating equipment, electrical pumps, etc., has acquired the plant and properties of the Young Pump Company, Michigan City, Ind., specializing in the manufacture of electrically operated vacuum pumps and accessories. The new owner will continue the operation of the Michigan City works as a branch plant.

The General Electric Company has almost completed extensions and improvements in its glass plant at Warren, Ohio, operated as the Niles division. A furnace was installed for glass-blowing machine service, and automatic machines and accessory apparatus have been installed.

The Conaut Machine Company, Concord Junction, Mass., manufacturer of electric and other power-driven loading machinery, has appointed J. Shuman Hower, Foster Building, Utica, N. Y., as agent for central New York.

Manning, Maxwell & Moore, Inc., 100 East Forty-second Street, New York, manufacturers of valves, injectors and other steam specialties, announce that since September 10 Percy M. Brotherhood has been appointed consulting engineer and Frank J. Baumis, vice-president in charge of the machinery department, both being in the New York office. Augustus Wood has also been appointed works manager of the Putnam Machine Company division, Fitchburg, Mass.

The Corliss Carbon Company, Bradford, Pa., announces that during the month of August it manufactured for one customer a total of 980,000 brushes, which if stacked flat would make a pile 5.29 miles high.

The Triumph Electric Company Cincinnati, manufacturer of motors, annaunces that Frank A. Wilch has been placed in charge of the Cleveland office, succeeding Edward S. Ford. Mr. Wilch was formerly associated with the Cleveland office of the company.

The Ohio Electric & Controller Company, 5900 Maurice Avenue, Cleveland, announces the appointment of G. R. Horne as district sales manager of the magnet department, 2158 Penobscot Building, Detroit.

The Ohio Brass Company, Mansfield, Ohio, manufacturer of porcelain insulators and other electrical material, announces the removal of its Philadelphia office from the Witherspoon Building to 1404 Packard Building, at Fifteenth and Chestnut Streets.

The Advance Electric Company, 6311 Maple Avenue, St Louis, manufacturer of alternating-current motors, announces that its Terre Haute (Ind.) office was moved on September 15 to 945 Mulberry Street to afford better shipping facilities and increased warehouse space.

The Hopewell Insulation & Manufacturing Company, Hopewell, Va., has been purchased by S. C. Cutler for the sum of $22,500. This offer was accepted by the court in its decree dated September 10 and includes the sale of the assets, property and effects of the company. James O. Heflin has been appointed receiver of the assets in place of H. J. Watkins, Jr.

The Economy Fuse & Manufacturing Company, Chicago, announces that its Minneapolis district sales office has been removed to 1008 Marquette Avenue.

The F. W. Wakefield Brass Company, Vermilion, Ohio, announces two new "Red Spot" kitchen units, which are said to embody several important improvements.

The Okonite-Callender Cable Company, Inc., has been organized by officials of the Okonite Company, Passaic, N. J., under New Jersey laws, with a capital of $1,000,000, to manufacture electric cables and kindred electrical apparatus. A large section of the former iron and steel works of the Gillespie-Eden Corporation, Market Street,

Paterson, N. J., has been taken over by the new organization. New machinery will be installed and the plant will be remodeled and improved for early occupancy. The present Okonite plant on Canal Street, Passaic, will be continued in service, it is stated, and the new company will not affect the parent interest in any way.

The Bussman Manufacturing Company, 3819 North Twenty-third Street, St. Louis, manufacturer of "Buss" fuses, announces that its branch office and storeroom in New York City is now at the Dodge Building, room 504, 53 Park Place. A very complete stock is carried in order to render prompt service. R. C. Bronsvel is in charge, with Percy Smith and Robert Stewart assisting him.

The General Electric Company announces that B. C. Bowe has been appointed manager of the Tungar sales division, which has been moved to Bridgeport, Conn., where most of the other sections of the merchandise department are now located. C. E. Hamann, K. W. Nelson and E. N. Sampson have also been transferred from Schenectady to Bridgeport with the department. The company further announces that W. M. Miller of the central-station department, Schenectady, has been given charge of mercury-arc rectifier sales, with headquarters at Schenectady.

The Gertler Electric Company, Inc., 220 West Eighty-third Street, New York City, jobber, announces the opening of a wholesale branch in Westchester County, New York, in order to furnish better service and free delivery in that territory. Among other lines represented are those of the Edison Lamp Works, National Carbon Company, National Metal Molding Company, Arrow Electric Company and the Duplex Electric Heater Company.

New Equipment Available

High-Speed Motor-Driven Grinder

A direct-connected grinder equipped with a new type of constant-speed motor is being placed on the market by Forbes & Myers, 172 Union Street, Worcester, Mass. The motor has been developed for speeds of 5,400 r.p.m. and 7,200 r.p.m. on 60-cycle energy and for 2,250 r.p.m. and 3,000 r.p.m. on 25 cycles. The motor is provided with a stator winding, a double-rotor construction being used to obtain high speed. The high speeds now attained are correct for grinding at speeds in the vicinity of 5,600 ft. per minute. The motor is rated at ⅔ hp. and can be furnished for grinding or other purposes where two-phase or three-phase energy is available for any voltage up to 550, and in larger sizes as required. A direct-current motor is also available.

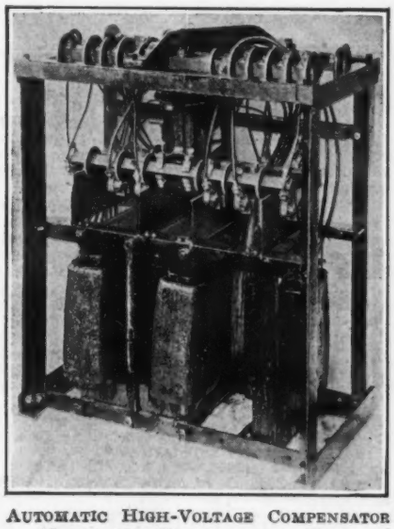
Electric Hoist

A new electric monorail hoist, in half-ton and one-ton sizes, designed to operate in minimum headroom, has been developed by the American Engineering Company, Philadelphia. This hoist retains many of the features of the other "Lo-Hed" hoists made by the company, but is smaller and is intended for general utility use where a light, handy hoist is needed.

Like all the "Lo-Hed" line, this hoist is able to draw the load hook up until it almost touches the rail, which makes it available in places where the headroom is very low. Automatic holding and lowering brakes are provided and a safety device checks the hoist and throws off the current at the upper limit of travel. Roller bearings and automatic lubrication are provided, and a factor of safety of at least five permits overloads in emergency. These hoists are furnished for direct or alternating current. All working parts are easily accessible, and, if necessary, the motor can be removed for repairs in a few minutes without touching the load on the hook.

Automatic High-Voltage Compensator

A push "button" operated automatic high-voltage compensator for voltages of 2,500 and below, has just been placed on the market by the Electric Controller & Manufacturing Company, Cleveland. With the exception of the overload panel, which is mounted on the top of



AUTOMATIC HIGH-VOLTAGE COMPENSATOR MECHANISM REMOVED FROM TANK

the tank and completely inclosed, the compensator is entirely submerged in oil, and the tank is so designed that the compensator is dust-proof, weather-proof, vapor-proof and fireproof. It can be installed either indoors or outdoors. With the starting transformers and the operating mechanism entirely submerged in oil and automatically operated, the possibility of explosions or high-voltage flashes is removed.

The push-button is operated by an independent low-voltage circuit which is taken from a separate transformer so that there is no danger of the operator ever coming into contact with the high-voltage circuit. The compensator is so designed that continuous torque is applied to the motor from the time the push-button is pressed until the motor has been brought up to speed.

Power Line Carrier Telephone Equipment

A telephone system utilizing high-frequency currents to carry the voice currents along the power lines themselves without the interference or other difficulties encountered when the usual form of telephone line is used has been developed by the Western Electric Company. The carrier telephone system consists of vacuum-tube transmitting and receiving apparatus at each station, condenser-coupled to two wires of the high-tension transmission line which are used to complete a full metallic circuit between them.

The power-switching apparatus and the high-frequency apparatus are mounted on two panels, each 72 in. x 19 in., and with the telephones, batteries, motor-generator set and coupling equipment, make up the complete apparatus at each station. The transmitter comprises a 1-watt oscillator-modulator circuit which provides sufficient output for the normal operation of the equipment. A 50-watt power amplifier is also provided to amplify the output in order to insure communication under line fault or emergency conditions. Duplex or two-way operation is employed by utilizing two different frequencies, one for transmitting, the other for receiving. Filters, automatically controlled, are provided to prevent interference.

The calling apparatus is selective and employs a modification of the well-known Western Electric signaling system extensively used for train-dispatching telephone circuits. The circuit may be extended to a telephone several miles from the carrier equipment with or without control of the carrier as may be desired. Such a station can be used by a load dispatcher. Provision is made for the adequate protection of the apparatus and its users from high-tension currents due to possible breakdown in the portion of the apparatus connecting the system to the power line.

Speed Reducer.—A totally inclosed speed reducer with all parts running in oil and provided with forced lubrication for speeds over 1,800 r.p.m. has been developed by the Meachem Gear Corporation, 122 Dickerson Street, Syracuse, N. Y. The reducer can be used for either step-up or step-down transmission and for any load up to 500 hp. The load is transmitted from the high-speed shaft through planetary gears to a slower rotating ring. In this ring are a number of rockers which engage with a spider keyed to the low-speed shaft. Upon operating, each of the rockers engaging with the teeth of the spider first compresses a spring plunger so that the load is transmitted gradually.

New Trade Literature

FLEXIBLE JOINTS FOR REFLECTORS.—The O. C. White Company, Worcester, Mass., is distributing a catalog insert describing its style "FL" universally adjustable joint, specially adapted to reflector mounting in the spotlighting and floodlighting of store windows.

POLE-LINE HARDWARE AND DISTRIBUTION SPECIALTIES.—Hubbard & Company, Pittsburgh, have issued catalog No. 24, in which are listed and described the complete requirements in pole-line hardware and distribution specialties for every type of line construction. In compiling this catalog the company has aimed to make it a reference book on line construction. The material shown and the construction methods described represent the latest types used in each branch of line work.

INSULATION.—"Commutator Insulation and Assembly" is the title of a booklet issued by the Mica Insulator Company, 68 Church Street, New York, containing useful information on commutators compiled from various sources. The booklet also discusses the properties of the various kinds of mica and explains how "Micanite," the trade name of the built-up mica manufactured by the company, is made and inspected. In addition, information concerning other insulation made by the company, armature slot insulation, tape, compound and varnish is included.

ELECTRIC ELEVATOR CONTROL EQUIPMENT.—The Cutler-Hammer Manufacturing Company, Milwaukee, has issued a booklet entitled "Cutler-Hammer Electric Elevator Controllers," known as publication No. 3,082. It describes and illustrates many types of elevator control apparatus for passenger and freight elevators. A section is devoted to auxiliary apparatus for use with elevator controllers, which include reversing switches, floor selectors, various limit switches, car switches and door switches.

CHAIN DRIVES.—The Morse Chain Company, Ithaca, N. Y., has issued two bulletins, known as publications Nos. 24 and 26A, entitled "Large Power Drives" and "Small Power Drives," covering the "Morse" silent-chain drives. The company is also distributing publication No. 27, entitled "A Chain of Evidence," containing twenty-two testimonials, in which 413 drives in twenty-six industries are mentioned, covering twenty-five types of equipment.

STOKERS.—A well-illustrated fifty-four-page booklet has been issued by the American Engineering Company, Philadelphia, describing the new Taylor stoker. The various developments since the first Taylor stoker was introduced eighteen years ago, as well as complete information and diagrams of the new stoker, are included. The operation of the Taylor steam-operated ash discharge and the Taylor rotary ash discharge are illustrated and described. Various representative illustrations in central-station and industrial plants, with some diagrams included, are also listed.

AUTOMATIC CONTROL OF COMBUSTION.—The Carrick Engineering Company, 138 South Clark Street, Chicago, has issued a thirty-two-page booklet which includes a very thorough discussion of automatic control methods and systems. It analyzes the conditions to be met in co-ordinating supply of steam with the demand and gives very interesting charts of steam pressure. The conditions necessary to obtain close steam regulation are discussed, and the comparison between damper position and steam pressure is shown.

BOILERS.—A booklet, describing in detail the design and construction of its new "Union Universal" boiler of the self-contained return-flue type has been issued by the Union Iron Works, Erie, Pa. The "Universal" boiler is made in sizes from 25 hp. to 150 hp. and is particularly adapted to installations where only small floor space is available.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Purchase and agency is desired in Feuerbach, Germany (No. 11,597), for ice-manufacturing machinery.

Purchase and agency is desired in Vratza, Bulgaria (No. 11,598), for ice-manufacturing machinery.

An agency is desired in Berlin, Germany (No. 11,605), for electrolytic copper.

Purchase is desired in Durban, South Africa (No. 11,680), for sugar-mill machinery, including cane conveyors and elevators.

An agency is desired in Bombay, India (No. 11,688), for brass, copper, spelter and aluminum in ingots and sheets, braziers, circles, wire, etc.

CABLE FOR YALLOURN (AUSTRALIA) POWER SCHEME.—Tenders will be received by the State Electricity Commission of Victoria, Melbourne, Australia, until Nov. 24 for 22,000-volt cable and accessories, specification No. 24/90.

TURBO-ALTERNATORS, CONDENSERS, SWITCHBOARDS, ETC., FOR CALEDONIAN COLLIERIES, AUSTRALIA.—The Caledonian Collieries, Ltd., Newcastle, New South Wales, Australia, will receive tenders until Nov. 25 for turbo-alternators, condensers, pumps, boilers, pipework, superheaters, fans, chimney, switchboards, transformers, etc. Tenders to be addressed to Howard Smith, Ltd., managing agents, Caledonian Collieries, Ltd., 35/45 Market Street, Melbourne, Australia. Specification may be obtained from Howard Smith, Ltd., 33 Cornhill, London, E. C. 3, England.

ELECTRIC STORAGE BATTERIES FOR NEW SOUTH WALES (AUSTRALIA) RAILWAYS.—Tenders will be received by the New South Wales Government Railways and Tramways, Sydney, Australia, until October, for two electric batteries for signal operating and two battery-charging motor-generators.

ELECTRIC LOCOMOTIVES AND MATERIAL FOR STATE RAILWAYS IN CZECHOSLOVAKIA.—Tenders, it is reported, will be received by the Ministry of Railways, Prague, Czechoslovakia, until Oct. 21 for electric locomotives and electrical materials in connection with electrification of the State Railways.

VOLTMETERS FOR CONSTANTINOPLE, TURKEY.—Tenders will be received by the Posts and Telegraph Department, Constantinople, Turkey, until Nov. 4 for 100 large and 500 small voltmeters.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

CALAIS, ME.—The St. Croix Gas Light Company is reported to be planning to rebuild its electric light and power plant, recently destroyed by fire, with a loss of $150,000.

SABATTUS, ME.—The Park Mills, Inc., plans to construct a water-power station, equipped with waterwheel, generator, etc.

PORTSMOUTH, N. H.—The Twin State Gas & Electric Company is preparing plans to build a local substation, to cost about $35,000, in connection with a transmission line to Dover.

BOSTON, MASS.—The Edison Electric Illuminating Company has applied for permission to issue $7,785,700 (par value) in capital stock, the proceeds to be used for extensions and improvements.

MELROSE, MASS.—The Malden Electric Company, it is reported, plans to construct a one-story substation, 65 ft. x 70 ft., on Upham Street. Charles H. Tenney & Company, 201 Devonshire Street, Boston, are engineers.

WOODBURY, CONN.—The Woodbury Electric Company has been acquired by the Connecticut Electric Syndicate, a subsidiary of the Connecticut Light & Power Company. Plans are under way for transmission-line extensions in this district.

Middle Atlantic States

BROADALBIN, N. Y.—The Broadalbin Electric Light & Power Company has applied to the Public Service Commission for permission to erect a transmission line and extend its system to supply electricity in the town of Edinburg under terms of a franchise granted by the town officials.

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 7 for 15,000 ft. incandescent lamp cord and magnet wire for the South Brooklyn Navy Yard (Schedule 2687).

GRANVILLE, N. Y.—The Granville Electric & Gas Company has petitioned the Public Service Commission for permission to erect a transmission line and a distribution system to furnish electric service in Hartford under a franchise granted by the Hartford Town Board.

HUDSON, N. Y.—The C. A. Van Deusen Company will soon take bids for a power house in connection with its proposed food-product packing plant on Water Street, to cost about $100,000. Monks & Johnson, 99 Chauncy Street, Boston, are architects and engineers.

LEWISTON, N. Y.—The Niagara Falls Power Company, it is reported, contemplates the construction of a hydroelectric power plant in this section, to cost about $1,500,000.

NEW YORK, N. Y.—The Consolidated Gas Company has filed plans for a transformer station and repair shop at Cromwell Avenue and 153rd Street, to cost about $200,000. William C. Morris is architect for the company.

NORTH TONAWANDA, N. Y.—The Tonawanda Power Company will install additional equipment at its substation on Robinson Street, to double the present output of the station.

BLOOMFIELD, N. J.—The General Electric Company has filed plans for the construction of an addition to the power house at its local plant, to cost about $19,000.

BURLINGTON, N. J.—The Public Service Electric & Gas Company plans extensions to its local substation, including the installation of transformers, etc. Extension will also be made at the substation at Mount Holly.

MONTCLAIR, N. J.—The Town Commission is considering the installation of an improved street lighting system on Orange Road, from Cedar to Washington Avenue.

BETHLEHEM, PA.—The Central Railroad of New Jersey is reported to be planning the construction of a power house at its proposed car and locomotive repair shops on the Lehigh River.

BRADDOCK, PA.—The United Electric Light Company has secured permission from the Borough Council to construct a steam-operated electric power plant on the Monongahela River, on First Street, to cost about $750,000, with transmission lines.

LOCK HAVEN, PA.—The Borough Council has authorized the installation of an improved street-lighting system on East Main and Henderson Streets.

MUNCY, PA.—The Borough Council is considering the installation of an improved street-lighting system. The Pennsylvania Power & Light Company furnishes electric service here.

PHILADELPHIA, PA.—The Pennsylvania Salt Manufacturing Company, Widener Building, has taken out a permit to build a transformer substation at its plant at Weccacoe and Porter Streets.

PHILADELPHIA, PA.—The Union Tank Car Company plans to build a power house, to cost about $50,000, at its car repair plant at Penrose Avenue and Gallows Lane, now in course of erection. Headquarters of the company are at 21 East Fortieth Street, New York.

WHITE HAVEN, PA.—The White Haven Light & Power Company plans for extensions and improvements in its local plant and system, including lines for light and power service. A twenty-year franchise has been secured from the city.

ASBESTOS, MD.—The Congoleum Company, Inc., Morris Building, Philadelphia, will electrify all departments at its local plant, recenty acquired. Extensive additions wil also be made to cost about $500,000.

BALTIMORE, MD.—The Consolidated Gas, Electric Light & Power Company is preparing plans for the construction of a substation at 601 and 603 Ethelwood Lane.

BALTIMORE, MD.—Bids will be received by the Board of Awards, office of the City Register, City Hall, until Oct. 1 for one 250-kw. generator and accessory apparatus for the power house, Bay View Hospital.

CHESTERTOWN, MD.—The Board of Town Commissioners has contracted with the Chestertown Electric Light & Power Company for extensions and improvements in the street-lighting system, lighting units, etc.

REISTERSTOWN, MD.—The Consolidated Gas, Electric Light & Power Company is preparing plans for the construction of a 66,000-volt steel-tower transmission line from its power plant at Susquehanna to this district.

GAULEY, W. VA.—Surveys are under way for the five proposed power dams on the Gauley and Meadows River in connection with the power project of the Gauley Power Company.

BRISTOL, VA.—The Twin City Furniture Company, recently organized with a capital of $250,000, is said to be planning the construction of a power house in connection with its proposed plant, to cost about $100,000. J. F. Crowder is secretary and treasurer.

WASHINGTON, D. C.—Bids will be received by the general purchasing officer, Panama Canal, until Oct. 9, for hand telephone sets, etc. (Panama Circular 1631).

WASHINGTON, D. C.—Bids will be received until Sept. 22 by the general supply committee for a quantity of electrical equipment for executive departments of the government, including metallic and non-metallic conduit, fuses, sockets, switches, wire, etc. (Class 6).

North Central States

DELHI, MICH. — The Detroit Edison Company has preliminary plans under way for a hydroelectric plant in this section with initial capacity of 2,000 kw. Extensions will be made in transmission lines in this district.

STURGIS, MICH.—The Smith Bell Lumber Company, Decatur, Ill., plans to build a power house at its proposed local lumber mill.

DAYTON, OHIO.—The Dayton Power & Light Company has filed plans for the erection of an addition to its electric generating plant at Third and Webster Streets, to cost about $70,000.

LIMA, OHIO. — The Detroit, Toledo & Ironton Railroad Company is said to be planning to build a power plant at its proposed locomotive and car repair shops in this district. The cost of the entire project is estimated at $2,500,000.

CENTERTOWN, KY. — The Kentucky Utilities Company has purchased the local electric lighting plant and will furnish service here from a transmission line in the future. A transmission line will be erected to Paint Lick, in this section for commercial service.

BRISTOL, IND.—Plans are under consideration by the Interstate Public Service Company for the construction of a hydro-electric plant on the St. Joseph River, near Bristol, to cost about $1,000,000. The company is also said to be planning to build a series of small hydro-electric stations on the Elkhart River, near New Benton, Baintertown and Upper Benton, Ind.

KOKOMO, IND.—The Northern Indiana Power Company has secured permission to issue $232,000 in capital stock, part of the proceeds to be used for extensions and improvements.

CUBA CITY, WIS.—The Electric Light Department is building a new distribution system and is installing ornamental lighting system on Main Street, consisting of fifty-one standards mounted with 300-watt lamps. J. R. Kay is superintendent.

GAYS MILLS, WIS. — The Interstate Power Company, McGregor, Iowa, it is reported, contemplates building a dam on the Kickapo River, Wis., and making improvements to the electric plants at Soldiers Grove, Prairie du Chien and Bloomington, all in Wisconsin.

WITTENBERG, WIS.—The property of the Wittenberg Light & Power Company has been acquired by Harry Brooks and Paul Fischer, both of Pulaski and others. Plans are under consideration for extensions and improvements.

CEDAR RAPIDS, IOWA. — The Iowa Railway & Light Company is considering building an addition to its electric power station at North Sixth Street and Dewey Avenue, East, to cost about $50,000.

DAVENPORT, IOWA.—Plans are under consideration for the installation of an ornamental lighting system on Main Street.

CLINTON, MO.—The City Council has engaged E. T. Archer & Company, New England Building, Kansas City, Mo., consulting engineers, to prepare plans for a new municipal electric power plant.

JOPLIN, MO.—Steps have been taken by the Kiwanis Club for the installation of an ornamental lighting system in the business district.

ST. JOSEPH, MO.—A special election will be held on Nov. 18 to vote on the proposal to issue $300,000 in bonds, the proceeds to be used for the construction of a municipal electric light and power plant. W. K. Seitz is engineer.

PLATTSMOUTH, NEB. — The Chicago, Burlington & Quincy Railroad Company has contracted with the Nebraska Gas & Electric Company to furnish power service at its local shops. The power plant at the shops will eventually be closed down.

Southern States

ASHEVILLE, N. C. — The Asheville Power & Light Company contemplates extensions and improvements in its system to cost about $150,000. The work will include replacing of wood poles with steel poles and rebuilding of lines for increase in voltage from 2,300 to 4,000. Improvements will also be made in the street-lighting system.

ROBERSONVILLE, N. C.—The Greenville Water & Light Company plans for the construction of a transmission line here for local service. It is understood that distribution will be handled by the Light & Mill Company, heretofore operating a local plant, recently destroyed by fire.

ROCKY MOUNT, N. C.—Bids will be received by the Mayor and Board of Aldermen until Oct. 8 for the construction of a power-plant building. William C. Olsen, Raleigh, is consulting engineer.

THOMASVILLE, N. C.—Bids will be received by the city of Thomasville until Oct. 8 for improvements to waterworks, including raw-water pumping station on Abbotts Creek, with pumping and electrical equipment; complete water purification works with mixing chamber, subsidence basin, filters and clear water reservoir, together with operating equipment, including complete pumping equipment and electrical connections, etc. William C. Olsen, Raleigh, is engineer.

FLORENCE, S. C.—The American Fruit Growers' Express Company plans to install electric power equipment at its proposed local ice-manufacturing and carcing plant, to cost about $400,000.

ERWIN, TENN.—The Louisville & Nashville Railroad Company, Louisville, Ky., and the Atlantic Coast Line Railway Company, Wilmington, N. C., contemplate the construction of a power house in connection with their proposed joint car and locomotive repair shops in this section, to cost about $1,000,000.

BETHESDA, ARK. — The Batesville White Lime Company is reported to be planning the construction of a power plant in connection with the development of limestone properties in a new district, to be known as Limedale. The cost of the entire project is estimated at $200,000.

CLARENDON, TEX. — The Childress Electric & Ice Company, Childress, has applied for a franchise to erect a transmission line for local service.

CROWELL, TEX.—The City Council has granted R. W. Porter, Blackwell, Okla., to construct and operate an electric plant here. The cost is estimated at $100,000.

EAGLE LAKE, TEXAS. — The Texas Central Power Company, San Antonio, has acquired the property, including ice-manufacturing plant, of the Eagle Lake Water & Light Company. Plans are being considered for transmission-line extensions and other improvements.

SOCORRO, TEX.—The El Paso Electric Company is planning to erect a transmission line in this section to supply service to Caudrilla, San Alixario and Fabens. The cost is estimated at $70,000.

SUGARLAND, TEX. — The Imperial Sugar Company, recently formed with a capital of $5,000,000, is planning to install electric power equipment at the local sugar refining plant of the Sugarland Industries, Inc., which the company proposes to take over and enlarge at a cost of $1,200,000.

Pacific and Mountain States

MONTESANO, WASH.—Schafer Brothers Lumber Company plans to install electric power equipment in connection with the rebuilding of its mill, recently destroyed by fire with loss of about $600,000.

SEATTLE, WASH.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 30, for one motor-generator set for the Puget Sound Navy Yard (Schedule 2658)

WENATCHEE, WASH.—The City Council has adopted resolutions providing for the installation of an improved street-lighting system on D, E and F Streets.

WENATCHEE, WASH. — The Great Northern Railway Company is considering the electrification of its line over the summit of the Cascade Mountains, between Wenatchee and Skykomish. The plans include the construction of a large hydro-electric plant on the Chelan River to furnish electricity. The cost of the entire project is estimated at about $7,000,000.

COTTAGE GROVE, ORE.—The Mountain States Power Company plans extensions and improvements in its transmission lines in this section, including rebuilding of a number of lines.

HUNTINGTON, ORE. — The Oregon-Washington Railroad & Navigation Company plans to built a power plant here, to cost about $22,000.

CULVER CITY, CAL.—The Board of City Trustees is considering the installation of ornamental street lamps on portions of Irving, Lucerne, Farragut, Van Buren, Braddock and La Fayette Streets.

LIVERMORE, CAL.—Bids will be received by the United States Veterans' Bureau, Arlington Building, Washington, D. C., until Oct. 21 for the installation of an automatic telephone system at the local veterans' hospital; also, for the installation of a fire-alarm system.

LOS ANGELES, CAL.—Bids will be received by the Board of Public Works until Oct. 14 for fire-alarm central-station equipment; also, until Sept. 29, for a quantity of cable. Plans and specifications are on file at the office of the city electrician.

LOS ANGELES, CAL.—The Municipal Power Bureau is considering preliminary plans for work in connection with the $16,000,000 bond issue, recently voted, and has approved tentatively the following for 1925 expenditures: Nine substations, to cost $1,400,000; underground cable lines in busiess district, $1,000,000; 40 miles transmission lines, $325,000; extensions and improvements in distributing lines, $1,600,000; additional distributing lines in new territory, $2,000,000; first unit of proposed transmission belt lines, $1,200,000; shops and warehouses, $500,000.

SAN FRANCISCO, CAL. — The Bass-Hueter Paint Company, 2240 Twenty-fourth Street, plans to install electric power equipment at its proposed plant on De Haro, Army, Kansas and Mariposa Streets, to cost about $500,000.

TUJUNGA, CAL.—The Consolidated Minerals Corporation contemplates the construction of a power house at its proposed cement mill and lime plant in the Little Tujunga Canyon. The cost of the project is estimated at $400,000.

BLACKFOOT, IDAHO.—The Utah Power & Light Company has acquired the local plant and systems of the Warm Springs Power Company. Plans are under consideration for transmission-line extension in this district.

EMMETT, IDAHO.—The Bureau of Reclamation will soon being work on the foundations for the proposed hydro-electric plant at the Black Canyon dam, to cost about $450,000. The entire output will be used by the Idaho Power Company, which will make an exchange for power with that generated at its plant in the Gem Irrigation District, Southern Idaho, to be used by the Reclamation Service in that section.

WINSLOW, ARIZ.—The Atchison, Topeka & Santa Fe Railway Company will install electric power equipment in its proposed local ice plant, to cost about $200,000, for which a general building contract has been let.

Canada

GUELPH, ONT. — The Hydro-Electric Power Commission of Ontario is considering the erection of a transmission line from the city limits to Marden Village.

PETERBORO, ONT.—The Utilities Commission contemplates erecting a transmission line along the River Road to supply electricity to Otonabee residents near the city.

PORTNEUF, QUE.—The power plant of the Portneuf Hydraulic Company was recently destroyed by floods.

WILKIE, SASK.—Tenders will be received by T. A. Dinsley, town clerk, until Oct. 15 for furnishing and installing internal-combustion engines, generators, exciters, switchboard, etc., in the municipal electric plant. A. A. Murphy, Saskatoon, is consulting engineer.

Electrical Patents

Announced by U. S. Patent Office

(Issued August 12, 1924)

1,504,815. TRAFFIC SIGNAL FOR MOTOR VEHICLES; S. F. Croy, Long Beach, Cal. App. filed Dec. 14, 1921.

1,504,823. PLUG CONNECTION; A. H. Kline, Chicago, Ill. App. filed Sept. 24, 1920. Will make contact when thrust into the socket without turning.

1,504,843. ELECTRICAL PLUG CONNECTER; W. E. Shore, New York, N. Y. App. filed April 4, 1921. For making rapid connection.

1,504,859. ADJUSTABLE SECONDARY RACK; W. P. Brady, New Britain, Conn. App. filed Sept. 22, 1923. Having an adjustable insulator adapted to be moved along the rack to any position.

1,504,869. ELECTRIC LAMP; G. M. Comer, Chicago, Ill. App. filed April 11, 1922. For railway use.

1,504,882. METHOD AND APPARATUS FOR TRANSMITTING SIGNALS; G. W. Elmen, Leonia, N. J. App. filed Jan. 16, 1920. Reduces hysteresis loss in systems which involve loaded circuits.

1,504,919. ELECTRICAL CONNECTER AND TERMINAL; J. R. Van Auken, Newark, N. J. App. filed Dec. 19, 1922. For storage battery.

1,504,928. ELECTRICALLY HEATED BOILER; P. Bergeon, Grenoble, France. App. filed April 4, 1921. Using electrodes immersed in the water.

1,504,940. TELEPHONE RECEIVER CIRCUITS; G. W. Carpenter and W. L. Carlson, Washington, D. C. App. filed Jan. 29, 1921. With leads shielded.

1,504,944. ELECTRICAL WATER HEATER; S. E. Cook, Lincoln, Neb. App. filed Oct. 29, 1921. Cylindrical unit screwed directly into the socket.

1,504,951. DIFFERENTIAL TRANSMISSION; C. G. Hall, Washington, D. C. App. filed May 11, 1921. In which electrical units are employed as action and reaction elements.

1,504,974. SYSTEM FOR TRANSMITTING ENERGY WITHOUT WIRES; C. Reno, Springfield, Mass. App. filed March 1, 1920.

1,504,978. LIQUID LEVEL INDICATOR; T. W. Robbins, Butte, Mont. App. filed March 22, 1921.

1,504,980. ELECTRIC LAMP; J. Schultz, New Britain, Conn. App. filed Dec. 7, 1923. For hand signaling, automobile use, etc.

1,504,988. APPARATUS FOR PERMANENTLY WAVING THE HAIR; H. Speetjens, Kensington, London, England. App. filed April 20, 1922.

1,505,031. LONG-DISTANCE AUTOMATIC SIGNALING MECHANISM; L. E. King, Douglas, Ariz. App. filed March 15, 1920. Indicating the position of a moving body, as a float.

1,505,055. SECRET SYSTEM FOR RADIO TELEGRAPHY; A. R. Molins, Havana, Cuba. App. filed May 19, 1922.

1,505,063. ELECTROMAGNETIC CHANGE-SPEED SYSTEM; H. L. Tanner, Brooklyn, N. Y. App. filed Dec. 18, 1917. For use in self-propelled vehicles driven by internal-combustion motors.

1,505,072. ELECTRICAL RESISTANCE; H. M. Walmsley, Norwood, Ohio. App. filed Nov. 13, 1922. Grid type, punched from sheet steel or other metal.

1,505,076. SYSTEM OF ELECTRICAL INSTALLATION; A. T. Sampson, Lynn, Mass. App. filed April 12, 1923. For tapping the main conductors, inclosed within a conduit, at any point in the system without disturbing or removing the conduits.

1,505,077. TREADLESS COUPLING FOR PIPES AND THE LIKE; A. T. Sampson, Lynn, Mass. App. filed Dec. 15, 1919. For flexible-armored cable.

(Issued August 19, 1924)

1,505,085. RADIO RECEIVING APPARATUS; C. E. Brigham, Washington, D. C. App. filed July 15, 1922. Radio frequency transformer.

1,505,089. TELEPHONE SYSTEM; H. D. Currier, Chicago, Ill. App. filed March 20, 1915. Multiple-line lamp system.

1,505,104. ELECTROCHEMICAL PROCESS OF TREATING LIQUIDS; F. N. Moerk, Philadelphia, Pa. App. filed March 23, 1923. As industrial and potable waters, sewage, factory waste, etc.

1,505,105. MULTI-OFFICE TELEPHONE SYSTEM; R. G. Richardson, Chicago, Ill. App. filed July 19, 1920. For handling inter-office calls between automatic and manual exchanges.

1,505,109. PROCESS FOR ELECTRODEPOSITING LEAD UPON IRON; B. S. Summers, Port Huron, Mich. App. filed Feb. 23, 1923.

1,505,153. STARTER FOR INTERNAL-COMBUSTION ENGINES; B. M. Leece, Cleveland, Ohio. App. filed Oct. 11, 1917.

1,505,158. FREQUENCY CONTROL SYSTEM; DeL. K. Martin, Orange, N. J. App. filed Nov. 23, 1921. Applies to distant control and more particularly to an arrangement for controlling from a distance a carrier frequency to be used for signaling.

1,505,166. STORAGE-BATTERY JAR; J. L. Rupp, Wilkinsburg, Pa. App. filed Aug. 24, 1922. Having integral lugs which support the plate rests.

1,505,171. TELEPHONE-EXCHANGE SYSTEM; F. A. Stearn, Paterson, N. J. App. filed April 25, 1921. Automatic switching.

1,505,179. HEATER CONDUIT; R. H. Whiteley, Chicago, Ill. App. filed April 23, 1923. For internal-combustion-engine cooling-water system.

1,505,198. METERING DEVICE FOR RECEIVING STATIONS; C. W. Hough, Boonville, N. Y. App. filed Sept. 19, 1922. To measure "wired wireless" service.

1,505,219. ELECTRIC STORAGE BATTERY; A. Setzer, Providence, R. I. App. filed Jan. 17, 1922. With means for sealing the covers.

1,505,228. ELECTRIC SWITCH AND LAMP SOCKET; F. Stehrer, Baltimore, Md. App. filed Aug. 31, 1921.

1,505,231. SIGNALING SYSTEM; J. F. Toomey, New York, N. Y. App. filed Dec. 23, 1920. Using high-frequency current.

1,505,234. VACUUM-TUBE FREQUENCY CONVERTER; M. K. Akers, Troy, Ohio. App. filed Dec. 13, 1920.

1,505,248. ELECTRIC CIGAR LIGHTER; V. E. Extrom, Minneapolis, Minn. App. filed April 17, 1922.

1,505,252. COMBINED INSULATOR AND TRANSFORMER; R. E. Frickey, Chicago, Ill. App. filed March 21, 1912.

1,505,275. OPERATING ALTERNATING-CURRENT RELAYS; J. Mills, Wyoming, N. J. App. filed July 20, 1921. In accordance with the direction of energy flow in the circuit.

1,505,276. SYSTEM FOR LOCATING THE SOURCE OF SOUND; J. Mills, Wyoming, N. J. App. filed Nov. 18, 1921.

1,505,301. FIXTURE ADJUSTER FOR OUTLET BOXES; H. R. Thompson, Falls Church, Va. App. filed Aug. 29, 1919.

1,505,314. ELECTRICAL GROUNDING CLAMP; W. R. Cox, Cleveland, Ohio. App. filed Aug. 19, 1920.

1,505,326. PHONETIC BURGLAR AND OTHER ALARM; M. Field, Chicago, Ill. App. filed Oct. 29, 1919.

1,505,329. SOCKET FOR VACUUM TUBES OR THE LIKE; C. A. Friedrich, Brooklyn, N. Y. App. filed Dec. 9, 1921.

1,505,406. PULL-CHAIN ELECTRIC SWITCH; H. J. Morey, Syracuse, N. Y. App. filed July 23, 1920.

1,505,424. ELECTROPLATING APPARATUS; F. G. Purinton, Waterbury, Conn. App. filed Oct. 25, 1922. Mechanically operated; for plating large quantities of small articles in bulk.

1,505,463. RADIOLOGICAL APPARATUS; F. Holweck, Paris, France. App. filed Nov. 18, 1922. X-ray apparatus.

1,505,478. APPARATUS FOR TREATING HOT-WIRE ELEMENTS FOR ELECTRICAL DEVICES; A. Macha, Cleveland, Ohio. App. filed Dec. 9, 1922.

1,505,494. PROCESS FOR EXTRACTING METALS; R. Rodrian, New York, N. Y. App. filed April 29, 1922. From ores and other minerals.

1,505,495. SMELTING APPARATUS; R. Rodrian, New York, N. Y. App. filed March 3, 1922. Electrolytic treatment.

1,505,497. ELECTRICAL MEASURING INSTRUMENT; F. W. Roller, East Orange, N. J. App. filed Dec. 20, 1920. For measuring alternating current of high frequency.

1,505,531. FLEXIBLE TERMINAL FOR IGNITION WIRES; R. W. Bennett, New York, N. Y. App. filed Feb. 19, 1920.

1,505,578. RAZOR; C. Barra, New York, N. Y. App. filed March 26, 1923. With heating element.

1,505,581. ELECTRIC METERING DEVICE; G. C. Brown, Cincinnati, Ohio. App. filed May 22, 1922. Maximum-demand meter.

1,505,583. ELECTRIC CONTROL SYSTEM; C. F. Burgeson, Minneapolis, Minn. App. filed July 19, 1923. Applicable to electric shovel and hoist control.

1,505,600. PROCESS AND APPARATUS FOR THE MANUFACTURE OF ELECTRICAL CONDENSERS; G. W. Pickard, Newton Center, Mass. App. filed June 8, 1920. Condensers of the sheet type using mica as a dielectric.

1,505,601. AUTOMOBILE SIGNAL; H. Podolsky, San Francisco, Cal. App. filed Sept. 22, 1919.

1,505,603. OZONE APPARATUS; J. R. Quain, Westminster, London, England. App. filed Dec. 27, 1922.

1,505,610. CLOCK, CHRONOGRAPH AND THE LIKE; A. Steuart, Edinburgh, Scotland. App. filed June 22, 1923. Driven by electric motor.

1,505,619. ALTERNATING-CURRENT MOTOR; S. R. Bergman, Nahant, Mass. App. filed Aug. 8, 1921. Single-phase, commutator type.

1,505,628. STREET INDICATOR; A. Dull, Los Angeles, Cal. App. filed July 18, 1923. For passenger vehicles.

1,505,629. MOUNTING FOR CASINGS OF ELECTRICAL APPARATUS; P. Dunning, Bloomfield, N. J. App. filed Nov. 17, 1919. Mounting for compensator.

1,505,633. CIRCUIT-CONTROL SYSTEM; A. C. Finney, Schenectady, N. Y. App. filed Feb. 2, 1923. For a plurality of electrical conductors arranged to be controlled by a plurality of switches.

1,505,644. ELECTRIC BATTERY; A. K. Huntley, Clyde, Ohio. App. filed Feb. 12, 1920. Dry cell, inactive until ready for use.

1,505,653. ELECTRICAL BRAKING CONTROL; R. H. McLain, Tenafly, N. J. App. filed Aug. 16, 1923. For a motor connected to an active load such as a belt conveyor or hoist.

1,505,654. READING LAMP; N. Macbeth, Pelham, N. Y. App. filed Jan. 5, 1923.

1,505,656. PRIMARY BATTERY; M. L. Martus, Woodbury, Conn. App. filed Feb. 19, 1924. Having an alkaline electrolyte.

1,505,669. APPARATUS FOR THE PRODUCTION OF OZONE; J. R. Quain, London, England. App. filed Dec. 8, 1919.

1,505,681. ELECTRIC GRIDDLE; M. L. Warner, Amherst, Mass. App. filed March 1, 1924. With a flat heating surface of material that is an electrical insulator as well as a conductor of heat.

1,505,693. BY-PASS VALVE FOR STORAGE-BATTERY VENTS; R. C. Benner, Bayside, N. Y., and H. F. French, Flushing, N. Y. App. filed Oct. 12, 1922.

1,505,702. PORTABLE LIGHTING PLANT; A. L. Curtis, Wauneta, Neb. App. filed Feb. 5, 1921.

1,505,710. TELEPHONE SYSTEM; F. S. Irvine, Huntington, N. Y. App. filed June 27, 1921. Machine switching.

1,505,715. TELEPHONE SYSTEM; M. Langer, Hermsdorf, near Berlin, Germany. App. filed Aug. 29, 1921. Circuit arrangements for a two-wire junction leading from an automatic exchange to another exchange in which the testing for engagement is effected over only one of the two wires.

1,505,716. RAIL BOND; F. C. Lavrack, Montclair, N. J. App. filed April 4, 1922. For railway signaling track circuit.

1,505,726. ELECTRICAL CURLING IRON HEATER; A. H. Opperman, Indianapolis, Ind. App. filed Sept. 16, 1922. Oven-like type.

1,505,730. INSULATOR AND SUPPORT THEREFOR; H. O. Rockwell, New Britain, Conn. App. filed April 3, 1922. Split insulator and support for holding a cable at a distance from a pole.

1,505,750. OPERATION OF OZONE MACHINES; J. Todd, Sewickley, Pa. App. filed June 10, 1922.

1,505,751, 1,505,752. MANUFACTURE OF OZONIZED AIR; J. Todd, Sewickley, Pa. App. filed June 10, 1922.

1,505,762. IGNITION DEVICE; J. H. Barnard, Brooklyn, N. Y. App. filed Sept. 10, 1921. For engines of the Diesel type.

1,505,811. LAUNDRY TIMER; G. W. Seattle, Cape May, N. J., and O. Risley, Wildwood, N. J. App. filed April 6, 1923. Applied to laundry machinery.

1,505,821. LAMP HOLDER; G. B. Thomas, Bridgeport, Conn. App. filed April 27, 1918. For sockets of the Edi-Swan type.

1,505,822. SYSTEM OF ELECTRIC DISTRIBUTION; E. D. Treanor, Pittsfield, Mass. App. filed May 24, 1923. In which a distribution circuit receives power from a supply circuit through a plurality of parallel feeders.

1,505,828. HEATER; R. C. Walberg, New Preston, Conn. App. filed May 22, 1922. Electric water heater.

1,505,842. SEPARATOR; C. L. Anderson, Butte, Mont. App. filed Aug. 31, 1920. For storage-battery plates, having apertured strips through which sediment may pass to the bottom of the cell.

1,505,853. ELECTRICAL GOVERNING APPARATUS; F. K. Brainard, West Allis, Wis. App. filed Oct. 9, 1920. For controlling or regulating prime movers.

1,505,925. AUTOMATIC REGULATION; H. E. Warren, Ashland, Mass. App. filed Dec. 12, 1921. Speed control for electric generating apparatus, to which are connected, in addition to the ordinary commercial load, electrically operated secondary clocks.

1,505,929. MOTOR CONTROL; A. C. Prescott, Schenectady, N. Y. App. filed March 25, 1922. By shifting the brushes of a motor of the commutator type.